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Mandibular micrognathia corrected by vertical osteotomy in the rami and iliac bone graft

■ *Jack B. Caldwell,* D.D.S., M.Sc., and William J. Amaral,† D.M.D., U. S. Army*

Three instances of surgical correction of mandibular micrognathia are described. The technic is a modification of vertical osteotomy in the mandibular rami as previously reported by Caldwell. It promises greater adaptability for the correction of individual variations of jaw deformities.

The minimal bony substance available for manipulation in surgical elongation of underdeveloped mandibles is sufficient basis for acceptance of the principle of bone grafting.

Robinson[1] in a preliminary report described a single case of micrognathism, corrected by vertical osteotomy in the rami, with addition of iliac bone to permit surgical elongation. This usage constitutes an advancement in surgical treatment of these deformities. Trauner and Obwegeser[2,3] in a series of articles have also suggested "implantation of bone between fragments" of an inverted L osteotomy in the ascending rami in these instances. Addition of bone in the surgical correction of micrognathia was reported earlier by Limberg[4] (1928) when he proposed the addition of a rib graft to the "step" operation of Pehr Gadd (1906).

In this paper we will report three cases of micrognathic deformity corrected by the vertical osteotomy procedure in the rami which was described by one of us (J.B.C.) in 1954.[5] At that time it was stated that modification of the operation for prognathism "should make possible the correction of micrognathic mandibles." Our method of correction involves a procedure similar to that suggested by Robinson, which is the addition of an autogenous iliac bone graft. Our first such operation was successfully accomplished in April 1953. It was a unilateral operation. In November 1956 and May 1957, bilateral vertical osteotomies in the rami with block iliac grafts were accomplished

in two additional instances. Results have been excellent in all three of our cases.

We believe that the addition of bone is basically sound inasmuch as there is lack of mandibular development in all micrognathic deformities in the first place and therefore insufficient bony substance with which to work in the majority of instances. We are also of the opinion that an operation in the ramus has several advantages over one performed in the mandibular body for the following reasons: (1) a field free of oral contamination can be assured; (2) contents of the inferior alveolar canal can be avoided; (3) earlier bony union can be expected; (4) teeth are unharmed, and (5) usually a better cosmetic and functional result can be secured.

Preoperative planning is essential in all corrective surgery for facial deformities. Prior to surgery, clinical appraisal of the deformity should be supplemented by roentgenograms, study models and photographs. Cephalometric-type roentgenograms made at a 5 or 6 foot distance provide a sufficiently accurate image of the mandible and opposing maxilla for the purpose of preoperative planning. A tracing made from this true lateral roentgenogram is used to produce a paper cutout which can be cut along the proposed line of osteotomy to indicate with accuracy the degree of advancement possible, the final relative position of the segments and the size of the void which needs to be filled with graft bone.

Study models placed in the corrected intermaxillary relation are used to indicate the location and necessary degree of occlusal adjustment by selective grinding to assure the proposed intercuspation of the dentition. Models also serve for the construction of appliances such as splints or arch bars when they are considered necessary to prevent damage to teeth during the period of immobilization.

■ *The Operative Procedure*

The operation is performed with the patient under general anesthesia with nasotracheal intubation. A submandibular approach is used via an incision about 7 or 8 cm. long placed about 2 cm. below the angle of the mandible. The exposure allows visualization of the lateral surface of the ramus and access to the sigmoid notch.

A vertical line for the proposed osteotomy is marked with methylene blue dye on the lateral surface of the ramus over the region of the mandibular foramen from the sigmoid notch to the angle of the mandible. Along this line a groove is cut into the lateral cortical plate with a no. 703 tapered fissure carbide bur in a straight dental handpiece at high speed, with a continuous drip of normal saline solution and suction (Fig. 1,b). Below the level of the mandibular foramen the cut may extend through the cortical plate, but at the level of the foramen complete penetration of the cortex is avoided. A series of drill holes are placed from the sigmoid notch to the anterior surface of the ramus, and with a flat, broad-bladed chisel the coronoid process is fractured (Fig. 1,d). The attachments of the temporal muscle on the medial surface prevent gross displacement of the coronoid process; however, sufficient relaxation is thus obtained to allow unimpeded advancement of the mandible, and impingement is thus avoided in functional move-

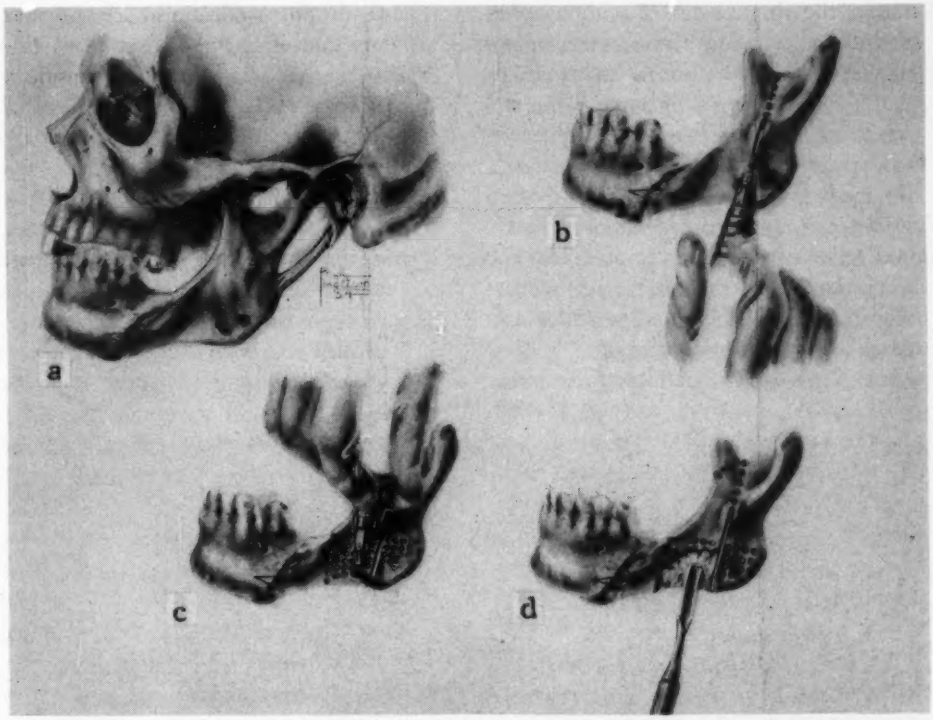


Fig. 1—Artist's representation of surgical procedure in Case 1. a, note malunion of old gunshot fracture, loss of teeth and close bite. b, vertical groove is cut into lateral cortex of ramus. Above foramen, drill holes facilitate surgical fracture with chisel and mallet. c, decortication of lateral surface of angle of mandible is started by closely spacing drill holes through cortical plate, except over that region occupied by inferior alveolar nerve. Cortex is not penetrated completely along this course. d, decortication of bed for bone graft is completed with chisel. Care must be exercised over course of inferior alveolar nerve to prevent injury to that important structure. Note drill holes from sigmoid notch obliquely down to anterior border of ramus, placed to facilitate fracture of coronoid process

ments of the mandible after healing is complete.

Before vertical sectioning is completed, decortication of the region of the angle is accomplished with a broad, flat, sharp, long-beveled stout no. 3 chisel, anterior and posterior to the line of osteotomy, thus preparing a bed to accommodate the bone graft to this region (Fig. 1,c and d). This is done to facilitate fitting of the graft and to promote early union by the apposition of two surfaces of cancellous bone. With decortication completed, the wound is packed with wet sponges before completion of the osteotomy, and the procedure is repeated on the opposite side when a bilateral operation is being performed.

On the second side osteotomy is carried to completion (Fig. 2,e). This is accomplished by deepening the groove above the mandibular foramen and pene-

trating the lingual cortex with a series of drill holes. Below the foramen, a no. 703 tapered fissure bur is used to complete the sectioning. Protection of medial structures is provided by placement of a wide periosteal elevator in contact with the medial surface of the ramus after the anterior elements of the internal pterygoid muscle have been elevated bluntly. Sectioning above the foramen is accomplished by a few blows with mallet and chisel.

A fairly wide, flat elevator is introduced into the lower cut and by a gentle rotatory movement the remaining thin plate of bone over the mandibular foramen is fractured and the vertical sectioning is completed. The inferior alveolar artery and nerve remain uninjured and in unaltered relation to the anterior fragment. This part of the procedure is then carried out on the first side. The purpose of deferring sectioning of the first side is for ease of handling the second side.

After completion of the bilateral osteotomy, the wounds on both sides are

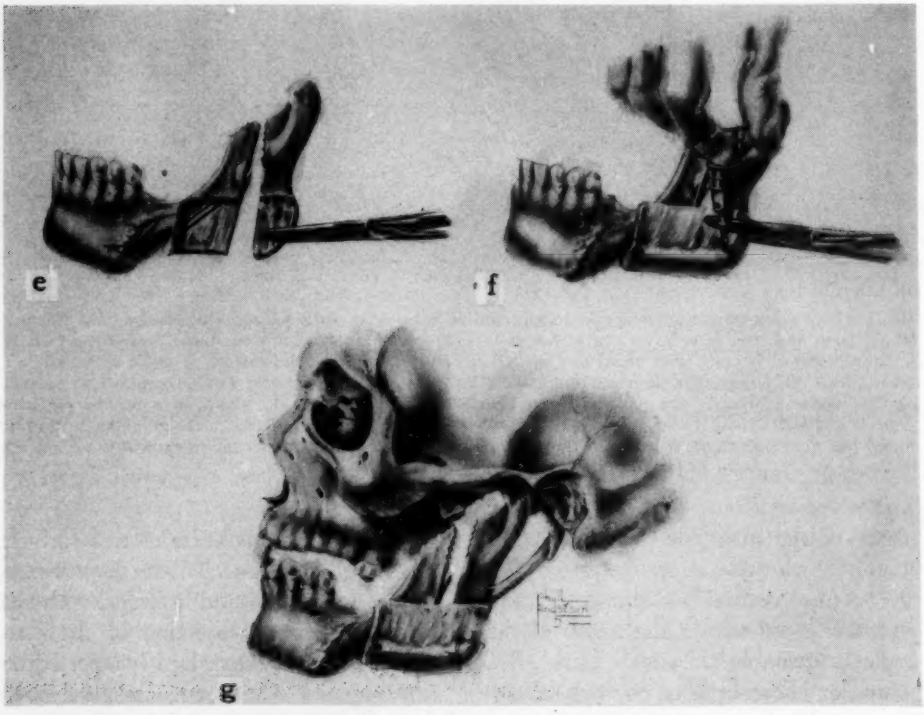


Fig. 2—e, coronoid process has been sectioned off with chisel, but is not removed. Vertical osteotomy is completed by fissure bur cut through and through below mandibular foramen and connection of drill holes by sharp chisel cuts above foramen. f, prepared iliac graft is inserted to position and clamped securely on both ends while drill holes are placed through graft and mandible. Wire sutures are placed to retain it. g, full thickness inlay bone graft is accomplished by virtue of mortise fitted onto lateral decorticated surface and into void resulting from osteotomy

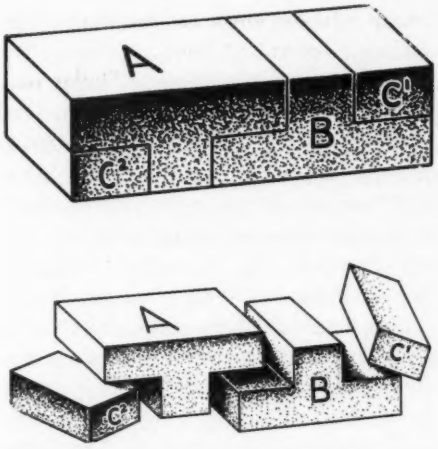


Fig. 3—Full thickness block of crest of ilium when sectioned provides two grafts (A and B). Thus, full thickness of graft is provided for mortising into void as mandible is advanced (see Figure 4)

packed with wet sponges, the surgical field is covered with sterile towels and attention is turned to preparation of bone graft and necessary intraoral manipulation.

The positioning of the mandible in the predetermined occlusal relation is usually accomplished by the assistant surgeon. Arch bars or cast labial splints are placed prior to surgery; therefore little time is expended in establishing proper intermaxillary relation and immobilization by the use of intermaxillary elastic ligatures. The mouth is again draped out of the field while the assistant surgeon changes gown and gloves.

During the first phase of the operation a section of iliac bone is obtained by a second surgical team, and is available for use as soon as the mandibular osteotomy is completed. While the assistant surgeon positions the anterior segment of the mandible, the surgeon prepares the graft. A full thickness section of the crest of the ilium, about 2 cm. wide by 5 to 7 cm. long including both cortical plates, provides sufficient bone in most instances to supply both operative sites. With the use of the Luc oscillating saw this rectangular block of bone is partially split, being decorticated in a manner so as to leave a full thickness of ilium to mortise between the sectioned portions of the ramus. Figure 3 illustrates a rectangular block, simulating the full thickness block of iliac bone. The two flattened T-shaped sections represent the forms cut for the graft to inlay into the prepared rami bilaterally (Fig. 3, A and B). The medullary portion of blocks C^1 and C^2 (Fig. 3) is reduced to chips for insertion into voids remaining after the block sections have been mortised into place. Figure 4 illustrates, in transverse section, the applica-

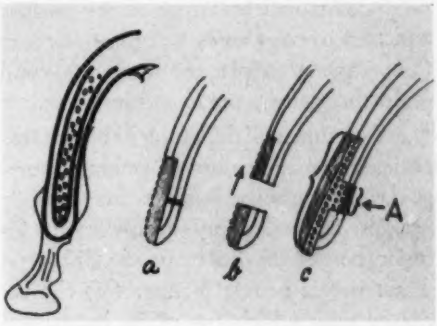


Fig. 4—Transverse section shows application of graft into ramus. a, shaded section is lateral decorticated surface; heavy dark line is line of vertical osteotomy. b, sectioned parts of ramus are distracted by advancement of body of mandible anteriorly. c, void created by decortication and advancement (a and b) is filled with full thickness iliac bone graft (A) with medullary bone of graft in contact with medullary bone of mandible, and cortex of graft aligned with lingual cortex of mandible

tion of the graft into the ramus. Figure 4,a illustrates the line of osteotomy (heavy dark line) and decortication of the lateral surface of the ramus, (shaded area). Figure 4,b shows distraction of parts by advancement of the anterior fragment. Figure 4,c indicates placement of the graft bone (A) with the mortised section filling the void and medullary bone of the graft in contact with the decorticated lateral surface of the ramus.

The surgical fields are again exposed and the bone grafts are tried into position to determine what areas need trimming for close adaptation. The graft is then inserted to place and held with bone-grasping forceps while drill holes are made along the inferior and posterior borders for transosseous wires (Fig. 2,f). Single .018 inch stainless steel wires are passed through the holes, twisted tight, cut, and the ends are turned into the drill holes. Essentially an inlay of bone is thus produced which by virtue of the mortise and transosseous wires is firm and secure (Fig. 2,g). After placement of the second graft, the wounds are closed in layers.

No unusual difficulty has been experienced in returning the internal pterygoid and masseter muscles to anatomic position and effecting closure at the inferior border of the mandible. This no doubt is due to two factors: (1) the accuracy with which the grafts have been fitted in place, and (2) the care taken in measurement and estimation of size of the grafts has provided the optimum amount of bone for good union and firm support without excessive bulk. Anticipation of some added mediolateral dimension is the reason for placing the initial skin incisions somewhat further below the lower border of the mandible than is customary.

The remaining layers are closed carefully in the usual manner. Modified pressure dressings are applied after checking the intermaxillary relation. Nausea and vomiting during recovery are usually well controlled by passage of a nasogastric tube and use of suction whenever nausea threatens. With good supervision during recovery, there is no hesitation in using intermaxillary wires if they are considered necessary. Usually during the 24 hours after the surgical procedure, the fluid requirements are supplied by intravenous infusion, though not infrequently these patients begin taking clear surgical liquids by the oral route within a few hours after surgery.

The operation, itself, is a tedious and time-consuming procedure, and about three hours per side is required for completion.

■ *Report of Cases*

CASE 1—A 23 year old enlisted man was transferred to Walter Reed Army Hospital on March 16, 1953 for consideration of specialized treatment of a traumatic deformity of the mandible. He had been returned through medical channels from an overseas station.

The patient had sustained a pistol shot wound in line of duty in Rome, Italy, in October 1950, which resulted in a badly comminuted fracture of the left side of the mandible. He had received emergency treatment and two operative procedures had been performed, one of which had been an open reduction with direct wiring of fragments in the body of the mandible. He was returned to duty,

but after four months service in Korea, was found to be unfit for combat duty because of the previous injury.

Physical examination revealed a small, well-developed man in good health with no physical defects except for the residual deformity of the mandible. There was a depression and loss of contour of the tissues overlying the ramus of the left side of the mandible and the angle (Fig. 5). There was a scar from in front of the ear to the angle of the mandible and forward to the mental region; the scar was well healed. There was deviation of the mandible to the left and severe malocclusion with close bite due to loss of numerous teeth (Fig. 6, left). There was also loss of sensation in the left side of the lower lip and left side of the tongue and weakness of the muscles of the left side of the lower lip.

The patient was referred to the prosthetic section for consideration of prostheses without surgical intervention. That department indicated that satisfactory restorations could not be made with the present close-bite jaw relation. On April 8, maxillary and mandibular splints were inserted. The maxillary splint was a sectional, wing type, screw lock with an acrylic biterim registering the desired occlusion with the lower teeth. On April 9 correction of the mandibular deformity was accomplished by unilateral vertical osteotomy in the left mandibular ramus with bone graft from the left ilium.

There were no serious immediate postoperative complications; however, swelling and ecchymosis of the tissues of the left side of the face persisted for an unusually long period. Furthermore, on April 15 drainage developed from the wound. Cultures were taken and the infection was rapidly controlled by use of the specifically indicated antibiotics. There were no other postoperative complications, and the patient recovered completely.

The patient was discharged from the hospital on May 1, and on his return on the thirty-seventh postoperative day, the elastic ligatures were removed to permit function. The patient was able to open the mouth to 13 mm. at that time and occlusion appeared to be good; however, because of the history of infection and the presence of the bone graft, the intermaxillary fixation was re-placed until the end of ten weeks of immobilization. On June 27, all intermaxillary fixation was removed. The maxillary splint was then utilized as a retainer for four more weeks (Fig. 6, right). At that time there were few noticeable residuals of the original injury and subsequent surgery. It should be noted that the patient continued to have paralysis and numbness of the left side of the lower lip and numbness of the left side of the tongue, which were caused by the original injury. Facial contour was pleasing (Fig. 7, left), and a final roentgenogram made five months after surgery revealed good healing of bone and a perfectly symmetrical mandible (Fig. 7, right).

CASE 2—A 25 year old wife of an Air Force noncommissioned officer was admitted to Letterman Army Hospital on November 8, 1956 for correction of severe mandibular retrusion.

The patient was referred to the hospital on October 30, 1956 from a nearby Air Force base with a complaint of temporo-

mandibular joint disturbance in the form of pain and crepitation of the right joint. This condition dated back as far as the patient could remember, but symptoms had become more severe in the past several months. No incident of trauma to the mandible could be recalled.

Physical findings were essentially negative except for those related to the chief complaint. There was facial asymmetry and retrusion of the mandible. There was severe Class II malocclusion, with deviation of the mandible to the left side during opening excursions. It was noted that the temporomandibular joints functioned unequally, with the right side hypermobile and the left side restricted in function. Roentgenographic examination of the temporomandibular joints revealed no demonstrable abnormality of the right side. The head of the left condyloid process appeared deformed, small, knobby and irregular; however, the temporomandibular fossa appeared normal. Cephalograms showed definite mandibular retrusion.

On the basis of these observations it was concluded that the patient suffered bilateral temporamandibular joint disturbance which comprised the following conditions: (1) a traumatic arthritis on the left side probably due to trauma at birth or during infancy, and (2) dysfunction on the right side representing degenerative joint disease secondary to the developmental deficiency on the left side, since the patient was forced to protrude her mandible to an extreme degree to attain an incisal relationship of her anterior teeth. It was considered that if the whole mandibular dental arch were moved forward, the problem of incision would be corrected and the cause of the temporomandibular joint disturbance overcome. Also, a significant cosmetic improvement would be obtained. Laboratory studies, including hematological and serological examinations, urinalysis and chest roentgenogram, were negative or within normal limits.

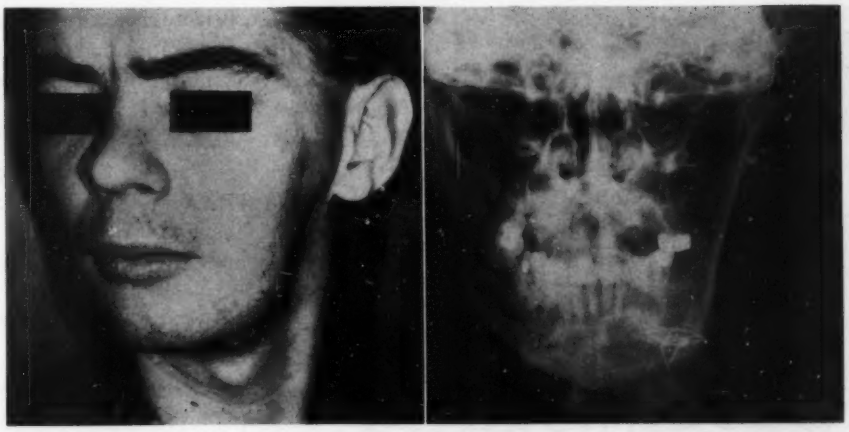
The patient was admitted November 8 and taken to surgery on November 9. Correction of the mandibular defect was accomplished by bilateral vertical osteotomy and bone graft (Fig. 8). Fixation of the advanced anterior fragment was accomplished by intermaxillary elastic ligatures on previously placed arch bars.

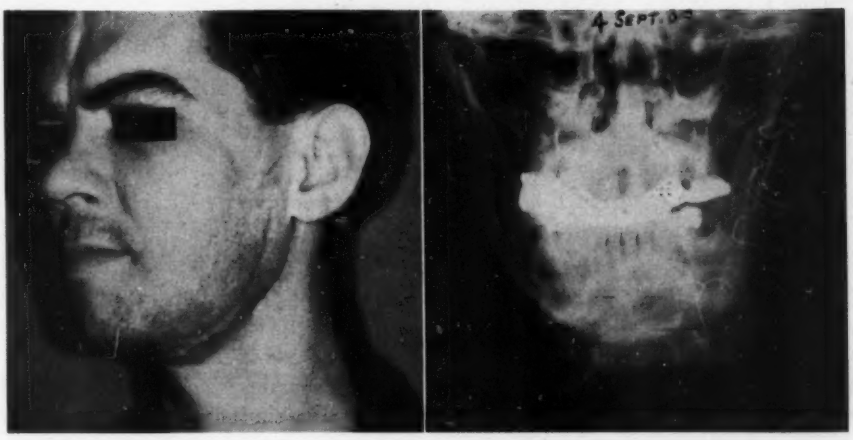
The postoperative course was uncomplicated. The patient took fluids by the oral route on the first postoperative day, and there was no sensory or motor

Fig. 5 (opposite page, above)—Case 1. Left: Traumatic deformity with depression of ramus of left side of mandible as result of gunshot injury. Right: Asymmetry of rami evident in postero-anterior view. Note mass of wire at site of old malunited fracture, as well as tiny residual metallic shell fragments in condylar region on left side (side of original injury)

Fig. 6 (opposite page, center)—Case 1. Left: Severe malocclusion with close bite and deviation of mandible to the left as result of malunion. Right: Maxillary splint in place. View, taken after left side of mandible was lengthened and deviation to the left was corrected, shows midline of maxilla in alignment with midline of mandible. Overbite has also been corrected

Fig. 7 (opposite page, below)—Case 1. Left: Depression in region of left mandibular angle is normally contoured after surgery. Right: Final roentgenogram made five months postoperatively reveals good healing of bone and a symmetrical mandible

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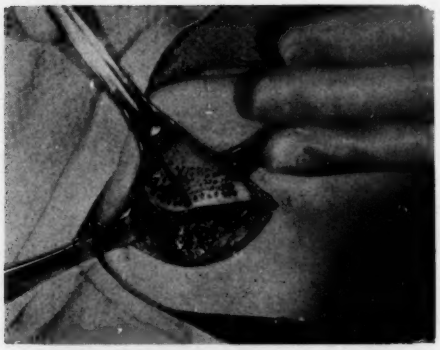

Fig. 8—Case 2. Surgical exposure showing vertical groove in lateral cortex and drill holes in cortex over angle of mandible in initial phase of decortication

loss noted at that time. All sutures had been removed by November 15. By November 20 the patient was able to walk with little difficulty, and she was discharged from the hospital on November 23. She was seen twice weekly until December 18, when the family moved. Further follow-up treatment was continued at Fitzsimons Army Hospital.

Intermaxillary elastics were removed on the fiftieth postoperative day, when the mandible was tested for stability. At that time, there was clinical evidence of firm union. The patient was kept on a soft diet for two weeks, after which an occlusal equilibration was accomplished. The patient was dismissed apparently free of any temporomandibular joint disturbance and very happy with the cosmetic result.[6]

CASE 3—A 23 year old Army noncommissioned officer sought treatment through the oral surgery service at Letterman Army Hospital for mandibular micrognathia and protrusion of maxillary anterior teeth. He stated that this condition caused him considerable embarrassment because of his appearance and he experienced great difficulty in incising food and in mastication (Fig. 9, above left). He had sought treatment elsewhere but had been told that his problem was of such extreme nature that prosthetic or orthodontic treatment alone or in combination would not suffice for correction. Family history revealed similar deformity in the patient's father.

Prior to the patient's admission, the oral surgery, prosthetic and orthodontic departments in consultation decided that surgical correction followed by prosthetic restorations of the maxillary central and lateral incisors would be feasible and of substantial benefit in improved function and appearance. A further consideration was that if the condition were left uncorrected, the patient would be faced with an extremely difficult prosthetic problem when complete dentures became necessary.

Physical examination was essentially negative except for the developmental deformity of the jaws. Oral examination revealed severe mandibular retrusion complicated by protrusion of the premaxilla and gross Class II malocclusion (Fig. 9, above right). The lower incisors contacted palatal tissue 1 cm. posterior to the gingival margin of the upper central incisors. The patient was unable to bring the upper and lower incisors into contact in protrusive movement, though there was no impairment of joint function on lateral or protrusive movement. A cephalometric-type roentgenogram revealed an undersized mandible and extreme protrusion of the maxillary central and lateral incisors. On the basis of these findings, it

was considered that this case represented micrognathic deformity of congenital nature.

Laboratory studies including hemotological and serological examination, urinalysis, and chest roentgenogram were negative or essentially normal. Lateral and posteroanterior roentgenograms and a complete intraoral periapical survey revealed multiple carious lesions but no periapical pathologic condition.

Mounted dental models indicated that on the right side an advancement of slightly more than 1 cm. would bring occlusal intercuspation into fairly acceptable functional relation. On the left side the necessary advancement was calculated to be about 1 cm. Areas in need of selective grinding (particularly the incisal edges of the mandibular incisors) were noted. On duplicate casts, arch bars were constructed for the maxilla and the mandible.

Prior to the patient's admission on May 1, 1957, all necessary dental restorations had been placed. On May 2, the occlusal

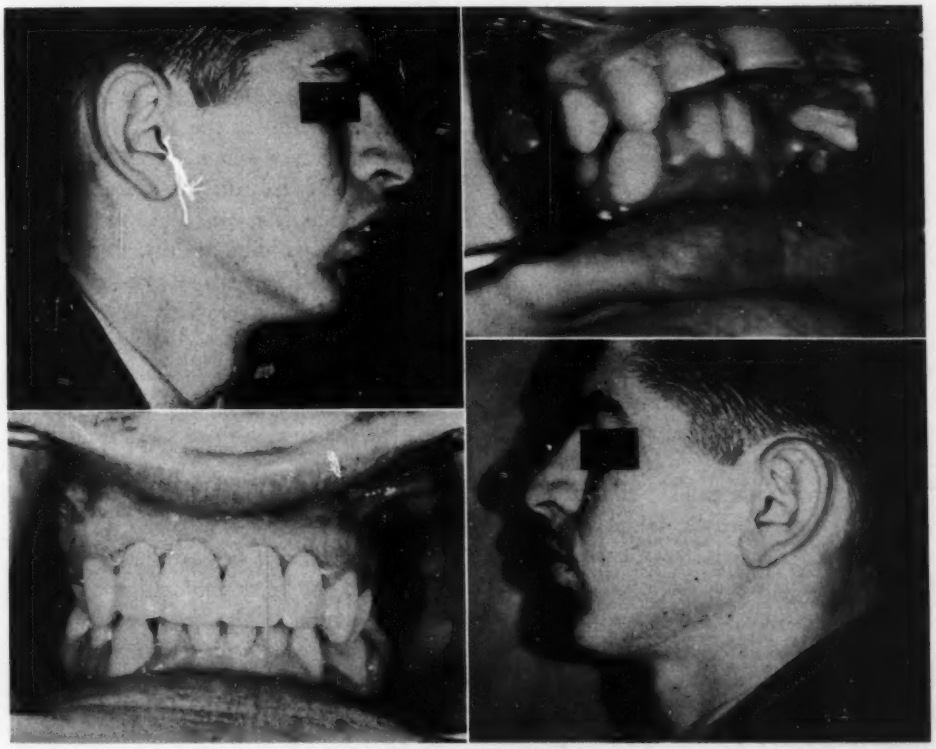

Fig. 9—Case 3. Above left: Micrognathia with facial deformity. Above right: Extreme protrusion of maxillary anterior teeth and Class II malocclusion. Below left: Normal cuspid relation has been provided and the four maxillary incisors have been replaced with partial denture. Below right: View taken at Landstuhl Army Hospital one and a half years after surgical procedure shows esthetic and functional result

adjustment by selective grinding was accomplished, the arch bars were placed and the maxillary central and lateral incisors were extracted. The next day the patient was taken to surgery and the micrognathic deformity was corrected by bilateral vertical osteotomy with autogenous iliac bone grafts.

The immediate postoperative course was uncomplicated. Nutritional and fluid requirements were managed by the intravenous route on the day of surgery, and on the first postoperative day clear surgical fluids were taken by the oral route. Thereafter, a nutritionally adequate diet high in protein, vitamin and caloric value, as is provided in maxillofacial cases, was taken via the oral route. Postoperative pain was minimal and easily controlled, and the amount of swelling was very slight. The patient was able to walk well by the tenth postoperative day. Immobilization by intermaxillary elastics was maintained until the seventh postoperative week when the elastic traction was lightened to single guide elastics which were maintained in place an additional week.

Profile roentgenograms showed normal jaw relation and facial profile, with no tendency to open bite or other complication. Clinical evaluation at that time revealed evidence of solid bony consolidation and complete return of sensation to the left side of the lower lip which had been numb immediately after the operation. The arch bars were removed and final occlusal equilibration was accomplished with resulting improvement in lateral and protrusive excursions. The patient was available for observation after discharge since replacement of maxillary anterior teeth was accomplished at the hospital (Fig. 9, below left). On July 31, the patient was able to open his mouth to a distance of 31 mm. measured between incisal edges of the right upper and lower cuspids, there was unimpaired movement in lateral and protrusive excursions and he was able to manage foods in a regular diet. A considerable improvement had been achieved functionally and cosmetically as a result of treatment (Fig. 9, below right).

■ *Discussion*

The three cases reported illustrate various degrees of functional and cosmetic impairment which may be encountered in mandibular micrognathia. Surgical correction by vertical osteotomy and iliac bone grafts fulfilled the objectives of improved function and esthetics. None of these patients had the extreme deformity which results from complete ankylosis of the temporomandibular joints at an early age. Microgenia which often accompanies micrognathia in the most severe cases could be treated by genioplasty in conjunction with vertical osteotomy. A variety of modifications of vertical osteotomy are possible to suit individual case requirements. Correction was achieved by unilateral operation, as in Case 1, or by bilateral operation as indicated. Where bilateral deformity exists, the degree of anterior-posterior correction for each side can be planned with precision preoperatively and an accurate advancement made at the time of operation. Likewise, vertical sliding at the osteotomy site may be employed to effect lengthening of a shortened ramus on one or both sides. The manipulation possible with bilateral vertical osteotomy in the rami will allow

for correction of associated open bite deformities.

In none of these cases was any manner of injury to the mandibular branch of the facial nerve encountered as a result of this operation. A transitory unilateral loss of sensation was incurred in Case 3, but sensation had returned within a period of a few weeks. No detrimental functional effect was observed in the major muscles of mastication at the angle of the mandible. This procedure allows for accurate repositioning of the masseter and internal pterygoid muscles, and the osteotomy of the coronoid tip lessens any displacing effect of the temporal muscle. The posterior fragment remains unchanged in relation to contiguous structures, and the condyle also remains in relatively normal relation to the glenoid fossa.

Advancement of the entire dental arch may serve to bring molars into function and proper occlusal relation. This feature of a ramus procedure often may be a factor of considerable importance since most of these patients have suffered loss of teeth, and when the jaw is in the retruded relation, second and third molars contribute little to masticatory efficiency. In these three mature persons, all of whom had suffered loss of some teeth, improved functional occlusion was obtained by this surgical method.

In the cases reported, the periods of intermaxillary fixation were ten, eight and seven weeks. The patient in whom fixation was maintained ten weeks had a history of previous infection. The relatively short period of healing results from positive fixation by the combination of direct transosseous wiring, accurate mortising of the bone graft and adequate intermaxillary stabilization.

■ *Summary*

An operation for correction of mandibular micrognathia is described. It is a modification of the previously developed method of vertical osteotomy in the mandibular rami for correction of prognathism. The procedure consists of vertical section of the rami, decortication of their lateral surfaces at the mandibular angle, advancement of the body of the mandible to a predetermined functional relation with the maxilla and mortising or inlaying autogenous iliac bone into the void created in the ramus. The mortised "inlay-onlay" effect results in excellent stability of the sectioned parts and, because of adaptation to the decorticated lateral surface, early clinical union is virtually assured.

Three cases reported illustrate correction of varying degrees of deformity which resulted from different causes, and also indicate the adaptability of the procedure to individual variations in deformities. Excellent functional and cosmetic results are achieved in these instances by this surgical method.

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1. Robinson, Marsh. Micrognathism corrected by vertical osteotomy of ascending ramus and iliac bone graft: a new technique. Preliminary report. Oral Surg., Oral Med. & Oral Path. 10:1125 Nov. 1957.

2. Trauner, Richard, and Obwegeser, Hugo. Surgical correction of mandibular prognathism and retrognathia with consideration of genioplasty. Part I. Surgical procedure to correct mandibular prognathism and reshaping of the chin. Oral Surg., Oral Med. & Oral Path. 10:677 July 1957.

3. Trauner, Richard, and Obwegeser, Hugo. Surgical correction of mandibular prognathism and retrognathia with consideration of genioplasty. Part II. Operating methods for microgenia and distoclusion. Oral Surg., Oral Med. & Oral Path. 10:787 Aug.; 899 Sept. 1957.

4. Limberg, A. A. New method of plastic lengthening of the mandible in unilateral microgenia and asymmetry of the face. J.A.D.A. 15:851 May 1928.

5. Caldwell, J. B., and Letterman, G. S. Vertical osteotomy in the mandibular rami for correction of prognathism. J. Oral Surg. 12:185 July 1954.

6. Irby, W. B. Personal communication.

Etiology of static bone defects of the mandible

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The etiology of so-called latent or static bone cysts of the mandible is reviewed. The conclusion is reached that these are not cysts, but defects in the bone. It is suggested that the term "developmental submaxillary gland defect of the mandible" is more descriptive of this entity.

The static or latent bone cyst is a name which has been applied to a cavity in the mandible, located between the mandibular canal and the inferior border of the mandible, just anterior to the angle. These cavities are asymptomatic and are found by routine roentgenologic examination of the mandible. They cause no visible or palpable deformity, unless there is a defect in the inferior border of the mandible. They are not associated with the teeth and appear as oval or ovoid cavities roentgenographically.

Stafne[1] reported 34 cases in which bone cavities were noted near the angle of the mandible. In one of his cases, the condition was bilateral. These cavities varied from 1 to 3 cm. in diameter and were all situated below the mandibular canal in a region as far forward from the angle of the mandible as the third molar tooth.

In all Stafne's cases, no surgical intervention was attempted. Therefore, only the roentgenologic appearance of these cysts could be described and their contents only contemplated. He believed that they were defects which arise during the formation of the mandible from a failure of normal deposition of bone in the region formerly occupied by cartilage, or by a failure of subperiosteal bone apposition at the lower border. However, he suggested the possibility that the cavities could be congenital in origin.

Peterson[2] in 1944 reported a cystic cavity in the mandible which was located between the inferior border of the mandible and the mandibular canal. The cavity was ovoid in shape and asymptomatic. The lesion, which was surgically approached by a submandibular incision, was found to interrupt the continuity of the inferior border of the mandible, but was empty.

Rushton[3] in 1946 reported a case of Bradlaw's which resembled roentgenographically the cases reported by Stafne.

Unfortunately, in this instance too the cyst was not explored surgically. Rushton regarded these cavities as the constricted remains of solitary bone cysts in the molar region, which had not been previously diagnosed, and the results of wasting of the bone around the angular prominence exposing a cyst already existing.

Jacobs[4] reported three cases in which he considered the defect in the mandible to be embryonic. In two of his three reported cases, surgical intervention was made; in one of these a part of the oral lobe of the submaxillary gland was lodged in a recess of the lingual surface of the mandible. In the second case, a considerable indentation with the absence of the cortex of the lingual surface of the mandible was noted, but no glandular tissue was evident.

Thoma[5] reported a case of "so-called latent bone cyst," in which he noted, on surgical intervention, a perforation in the inner surface of the jaw. The lesion was demonstrated to be a lingual erosion which was associated with reparative bone formation. A tumorous mass, from the submaxillary region, was noted to fit into the existing lingual defect. The pathologic examination revealed connective tissue dysplasia and a reactive lymph node.

Fordyce[6] reported two cases in which he found that the defect was occupied by normal submaxillary gland structure. He thought that these cavities were anomalies of development, rather than pathologic lesions. He supported his view by the following criteria: (1) the constancy of the site and dimensions over a period of time; and (2) his findings of submaxillary gland structure and inclusions of an accessory lobe of normal submaxillary salivary gland tissues in the body of the mandible.

Bernstein, Lam and Pomije[7] in 1958 reported a case in which they explored the cavity surgically and found it to be devoid of any contents. They suggested the possibility that the lesion was a roentgenographic rather than a pathologic entity, and proposed the term "static bone cavity" to describe the lesion.

■ *Report of a Case*

A case of an osseous defect in the mandible was seen at the Veteran's Administration Hospital in Hines, Ill. The patient, a man of 60 years, was admitted to the hospital for the removal of bilateral cataracts. While convalescing from his eye surgery, he was referred to the dental department for an examination of his mouth. On routine dental roentgenographic examination, a radiolucent oval defect was noted below a retained lower third molar root fragment (Fig. 1, left). It was not associated with the tooth and was located between the inferior border of the mandible and the mandibular canal. Extraoral films of the mandible were ordered, as well as a skeletal survey of the calvarium, long bones and pelvic region to rule out any other bone involvement. A complete laboratory examination was ordered and a review of his physical and systemic condition was made. All the findings were negative and no other bony lesions were discovered.

It was our initial impression that this was another latent bone cyst such as that Stafne had described previously. In order to make a diagnosis, it was decided that a surgical intervention was warranted. An extraoral approach was chosen, but be-

cause of the patient's resistance, an intraoral approach was agreed on finally.

With the patient under local lidocaine hydrochloride mandibular block and buccal infiltration anesthesia, an incision was made across the crest of the lower alveolar ridge, across the retromolar pad and on to the pterygomandibular raphe. The mucoperiosteum was reflected from the underlying bone and from the lateral surfaces of the remaining teeth to the region of the mental foramen. Thus a very generous flap was formed, which exposed the mandible from the ramus to the mental foramen and the entire inferior border of the mandible in this region. By means of bone drills, a defect was located in the lateral surface of the mandible, directly beneath the third molar root fragment. The area was defined and cleared with osteotomes and rongeur forceps. With a large periosteal elevator, the cavity was entered and an encapsulated mass enucleated. The cavity was explored and found to extend through the lingual cortex of the mandible with a thin strip of cortical bone bridging the inferior border. The region was debrided and saucerized, and the inferior border of the defect was removed for inclusion in the biopsy. It was decided to leave the root fragment in place in order to demonstrate that the defect was not of odontogenic origin. The patient had an uneventful recovery, and subsequently the molar root fragment was removed. A postoperative view is shown in Figure 1, right.

■ *Pathologic Findings*

The specimen submitted was a firm, gray-tan, wedge-shaped mass with a smooth, curved surface. It measured 0.5 by 0.5 cm. There also was a rectangular piece of bone, 0.7 by 0.3 cm. Microscopic

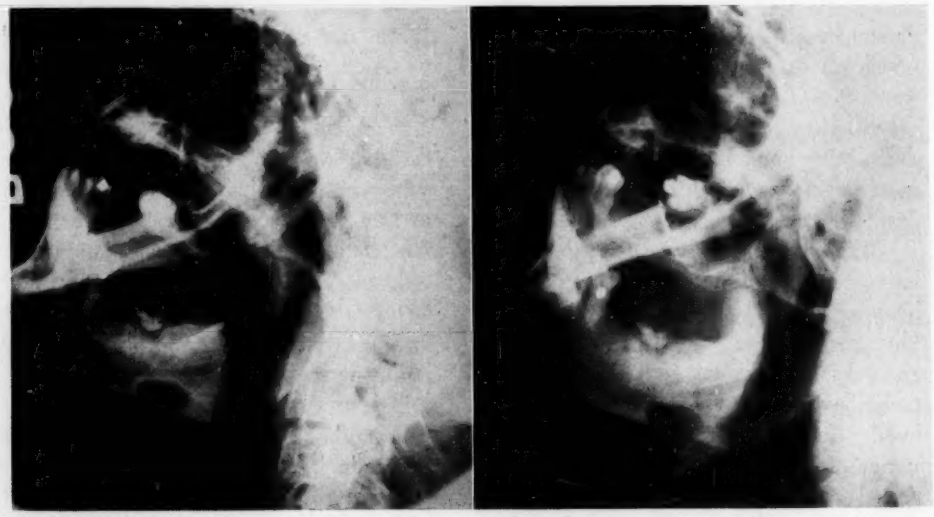

Fig. 1—Left: Preoperative view showing radiolucent oval defect in body of mandible, between inferior border and mandibular canal. Right: Postoperative view

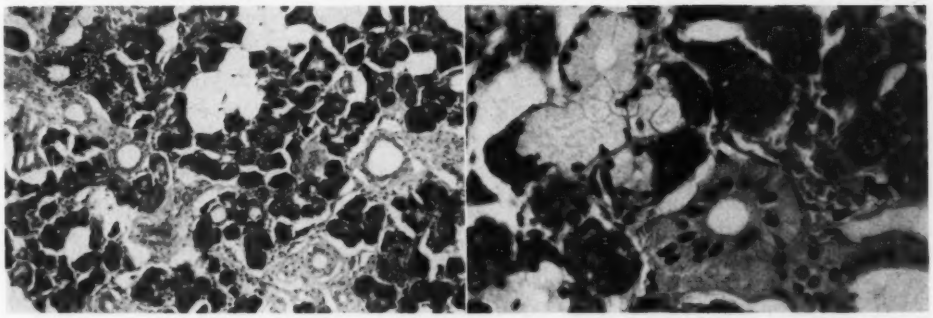

Fig. 2—Left: Low power view of submaxillary gland showing periductal fibrosis, lymphocytic infiltration, serous acini and ducts. Right: High power view of normal submaxillary gland showing serous acini, mucous gland with serous demilunes and ducts

examination showed lobuli of serous acini (Fig. 2, left). The cells all were filled with secretory granules. Few mucous glands were seen with serous demilunes. The ducts showed periductal fibrosis. There was slight interstitial lymphocytic infiltration. Such findings are compatible with submaxillary glands showing slight inflammation and fibrosis.

■ *Discussion*

A cavity in the body of the mandible was explored surgically and found to contain normal submaxillary gland structure, with some evidence of inflammation and obstruction. No evidence of any cyst was found, and both the lingual and lateral cortex of the mandible were invaded. Only a small strip of bone prevented a disruption in the continuity of the inferior border of the mandible.

In one of the cases reported by Jacobs and both of the cases reported by Fordyce, normal submaxillary gland tissue was noted. In the other case of Jacobs and those of Peterson and of Bernstein, Lam and Pomije, no contents were found in the ovoid defects explored. All these defects were located in the so-called submaxillary fossa of the submaxillary or submandibular gland.

The only other case which has been reported in the literature and surgically explored was that of Thoma. However, the histologic findings of his case were nonglandular tissue.

Anatomically, the upper lobe of the submaxillary gland, in most persons, lies on the medial surface of the lower border of the mandible. On the medial surface of the body of the mandible, below the mylohyoid line, is a slightly concave region termed the submaxillary fossa, because of its relation to the submaxillary gland. It is not inconceivable that a hypertrophy of the upper lobe of the submaxillary gland could cause an erosion in the mandible, giving rise to a definite defect. Another explanation is that there was a congenital absence of bone in this region due to the entrapment of a portion of the submaxillary gland during the development of the mandible. The static nature of the defect can be best explained by the limited size of the salivary gland accessory lobe. Such a lobe would not in-

crease or decrease in size over a long period. Therefore, the defect would remain "static."

The inflammatory changes and evidence of obstruction in the glandular tissue was probably due to the normal movements of the mandible, which caused these changes on the entrapped portion of the gland.

Some of the defects that were surgically explored were devoid of any contents. This can be attributed to the dislodgment of the entrapped portion of the gland during the surgical procedure.

■ *Conclusions*

1. The so-called latent or static bone cyst of the mandible is not a cyst, but a defect in the bone.

2. The finding of normal submaxillary gland structure within these ovoid defects explains their etiology. They are caused either by an erosion of the mandible due to the pressure of a hypertrophied submaxillary gland, or by a congenital defect due to the entrapment of portions of the upper lobe of the submaxillary gland.

3. The region of their appearance in the mandible is in close relation with the submaxillary fossa of the mandible, in which lies the upper lobe of the submaxillary gland.

4. A perusal of the literature indicates no progressive changes in these lesions, and the finding of normal submaxillary gland tissue in those instances in which surgery was performed would indicate that surgical intervention is not indicated.

5. The term "developmental submaxillary gland defect of the mandible" is suggested to describe better this entity.

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1. Stafne, E. C. Bone cavities situated near the angle of the mandible. J.A.D.A. 29:1969 Nov. 1942.

2. Peterson, L. W. Cystic cavity in the mandible; report of a case. J. Oral Surg. 2:182 April 1944.

3. Rushton, M. A. Solitary bone cysts in the mandible. Brit. D. J. 81:37 July 19, 1946.

4. Jacobs, M. H. Traumatic bone cyst. Oral Surg., Oral Med. & Oral Path. 8:940 Sept. 1955.

5. Thoma, K. H. Case report of a so-called latent bone cyst. Oral Surg., Oral Med. & Oral Path. 8:963 Sept. 1955.

6. Fordyce, G. L. Probable nature of so-called latent haemorrhagic cysts of the mandible. Brit. D. J. 101:40 July 17, 1956.

7. Bernstein, H. F.; Lam, R. C., and Pomije, F. W. Static bone cavities of the mandible: review of the literature and report of a case. J. Oral Surg. 16:46 Jan. 1958.

■ Advice

To the young I should offer two maxims: don't accept superficial solutions of a difficult problem, and it is better to do a little good than much harm. I should not offer anything more specific; every young person should decide on his or her own credo.—*Bertrand Russell.*

Mandibular prognathism: its etiology and a classification

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The etiology of prognathic facial disharmony is difficult to determine since heredity, endocrines, growth of the cranial base, appositional bone growth, and functional activity all influence the final facial form. A logical classification of prognathic types is presented which will help to simplify the discussion of such patients and to choose the proper surgical treatment.

The facial disharmony known as mandibular prognathism has become a focal point of interest and enthusiasm in oral surgery throughout the past 20 years. The problems associated with this condition have been with mankind since the earliest recorded times. Fortunately only a small percentage of the population is prognathic. This anomaly of the craniofacial skeletal complex develops on a genetic basis and may be intensified or repressed in varying degree by endocrine and environmental factors. Because there are no known preventive measures, a skeletal deformity is irreversible except by surgical intervention.

■ *Growth of the Mandible*

An understanding of mandibular growth should bring some appreciation of the complex background of mandibular prognathism. Infants are not born prognathic, but the hereditary factors imparted to the first branchial arch become manifest with the postnatal growth of the individual.

The embryonic mesenchymal tissue of the first branchial or mandibular arch gives rise to the cartilagenous bar known as Meckel's cartilage. This cartilage is not converted into the mandible but is enveloped by membranous bone which appears on its lateral aspect as early as the fortieth day of fetal life.[1] Thus the mandible develops as a membranous bone although centers of cartilage contribute to its development. An upward growth of the membranous bone of the developing mandible forms the body, the ascending ramus, the condyle and the coronoid

process. Where the upward growth contacts the squamous temporalis, a synovial joint is formed.

The cartilage core of the mandible is replaced by bone during the fourth month with the exception of a narrow zone immediately beneath the fibrous covering of the articular surface of the condyle. This secondary hyaline cartilage covered by dense fibrous tissue then becomes the major growth center of the mandible.[2,3] Fusion of the halves of the mandible at the midline occurs shortly after birth and there is no major growth contribution in this region after that time. Further growth of the body of the mandible is appositional, with all surfaces modified by periosteal and endosteal growth and by resorption. Major appositional growth occurs along the posterior border of the ramus, while resorption along the anterior border provides space for the successive eruption of posterior teeth. Condylar growth increases the height of the ramus and carries the body of the mandible downward and forward in harmony with the other bones at the facial skeleton.[4] Appositional growth of the alveolar process is stimulated by tooth development and eruption. At the coronoid process and the gonial angle where the major muscles of mastication insert, there is also appositional growth. Contour alteration and internal structural changes in the mandible are responses to the amount of functional activity of the part.[3,5,6] Developmental changes in the cranial base exert definite influences on the position of the developing mandible. The constancy of the gonial angle of the mandible is indicative of the harmony of all of the contributing influences. The approximate ages at which adult mandibular dimensions are attained are 18 years in the female and 20 years in the male.

This review has shown that the etiology of prognathic facial disharmony is difficult to determine since it is a result of the aberration of one or more of the afore-mentioned factors, that is, heredity, endocrines, growth of the cranial base, appositional bone growth, bone resorption, alveolar process development and functional activity.

■ *Classification of Mandibular Prognathism*

Customarily mandibular prognathism is spoken of as a typical deformity of uniform characteristics. Yet if any group of individuals who appear at first glance to be prognathic is analyzed, some significant variances will be found. With the hope that these variations may be better understood for more logical corrective procedures by surgery, the following classifications are presented:

Type A. Total prognathism with an increase in length of both the maxilla and mandible (Fig. 1).

Type B. The maxilla of normal length whereas mandibular length is within the prognathic range (Fig. 2).

Type C. An underdeveloped, shortened maxilla (retrognathic) whereas the mandible is within a normal or increased range (Fig. 3).

Type D. Normal dental intermaxillary relations but a prognathic appearance due to increased length of the basal bone and therefore a mental prominence (Fig. 4).

Type E. The maxilla of normal length whereas the mandible is prog-

Fig. 1—Type A, maxilla within range of prognathism; mandible within range of prognathism

Fig. 2—Type B, maxilla within normal range, mandible prognathic

Fig. 3—Type C, shortened maxilla, mandible within or above normal range

Fig. 4—Type D, maxilla within normal range, occlusion and alveolar process in normal relationship, mandible prognathic because of basalar prognathism

Fig. 5—Type E, maxilla within normal range, mandible prognathic with lengthening of the lower third of the face and an open bite anteriorly

nathic and the lower third of the face lengthened by an open bite relationship (Fig. 5).

The comparisons, real versus apparent, or absolute versus relative mandibular prognathism, are subjects of every discussion of the foregoing classification. Type A, although an example of prognathism, is not considered to be a reflection of overgrowth of a part or parts of the craniofacial skeletal complex but secondary to the relationship of the horizontal and vertical cranial base components.[1,7,8] This may be considered to be a true prognathism of a genetic origin.

Type B is the real or absolute mandibular prognathism and is thought to be a development of the mandible beyond normal limits. The effect of growth of the cranial base on jaw position must be considered as a factor in producing or initiating this type of deformity.

Type C, a mandibular prognathism of a so-called apparent or relative nature, is manifest as a shortened maxilla with a contracted or reduced palate secondary to a deficiency in growth and development of the maxilla. A lower occlusal plane and increased gonial angle are evident.[9] It has been claimed that about 33 per cent of instances of mandibular prognathism are the result of arrested maxillary development.[10] An example of Type C is seen in some young adults afflicted with congenital cleft palate in which maxillary development has been deficient.

Type D may also be included in discussions of the relationship of cranial base to mandibular growth as in Type B.

Type E presents the complication of additional masticatory impairment from downward warping of the mandible. The anterior open bite and lengthening of the lower third of the face identify this type.

The foregoing review of mandibular growth and the presentation of a classification of morphologic types of mandibular prognathism may help to simplify the discussion of treatment for such patients and facilitate communication between oral surgeons and orthodontists. The use of such a classification in studies dealing with the treatment of mandibular prognathism will also be of value.

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1. Symons, N. B. B. Studies on growth and form of the mandible. D. Record 71:41 March 1951.

2. Weinmann, J. P., and Sicher, H. Bone and bones. St. Louis, C. V. Mosby Co., 1947, p. 94.

3. Sicher, H. Growth of the mandible. Am. J. Orthodont. & Oral Surg. (Orthodont. Sect.) 33:30 Jan. 1947.

4. Rushton, M. A. Growth of the mandibular condyle in relation to some deformities. Brit. D. J. 76:57 Feb. 4, 1944.

5. Brodie, A. G. Some recent observations on growth of the face and their implications to the orthodontist. Am. J. Orthodont. & Oral Surg. 26:741 Aug. 1940.

6. Scott, J. H. Growth and function of muscles of mastication in relation to development of facial skeleton and of the dentition. Am. J. Orthodont. 40:429 June 1954.

7. Björk, A. The face in profile: an anthropological x-ray investigation on Swedish children and conscripts. Lund, Berlingska Boktryckeriet, 1947.

8. Björk, A. Follow-up x-ray study of individual variation in growth occurring between ages of 12 to 20 years and its relation to brain case and face development. Am. J. Orthodont. 41:198 March 1955.

9. Stopf, W. C. Roentgenographic appraisal of facial pattern in class III malocclusion. Thesis, University of Illinois School of Dentistry, 1940, p. 28.

10. Sanborn, R. T. Differences between facial skeleton patterns of class III malocclusion and normal occlusion. Thesis, University of Illinois School of Dentistry, 1952, p. 33.

Etiology and management of micrognathia

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Micrognathia may be congenital in the newborn, and presents unique problems which may be of an emergency nature. Many factors may affect the condylar growth centers; among these are trauma, inflammation, and irradiation. These are complicated frequently by ankylosis of the temporomandibular joint. Treatment is essential and consists, basically, of re-establishing mobility of the mandible, with subsequent recontouring as necessary.

Micrognathia in the newborn is characterized by a small, receding mandible. It is often associated with a partial cleft of the palate and occasionally with other anomalies. The receding lower jaw is symmetrical, and roentgenograms reveal normal vertical and horizontal rami and condyles. The descriptive term "bird-face" is often applied to these infants. The lack of forward development of the mandible forces the tongue to lie in a posterior prolapsed position, which results in respiratory obstruction and interference with swallowing. The tongue produces a ball-valve obstruction so that the inspiratory phase of respiration is characterized by considerable sternal retraction and episodes of cyanosis. Death from suffocation may result when the child lies on its back and the tongue occludes the airway.

A difficult feeding problem is introduced with this deformity, since the infant is unable to control the tongue adequately in swallowing. Feedings are accomplished with great difficulty and are often limited to small quantities. Feeding is further complicated by vomiting and aspiration of the formula. Aspiration pneumonia is common in these infants. Thus the infant goes through a prolonged period of malnutrition and actual starving (Fig. 1).

■ *Historical Background*

The earliest discussion of the clinical problem of micrognathia appeared in 1911 with a report of two cases by Shukowsky[1] on "Etiology of Congenital Inspiratory Stridor." Pierre Robin,[2] of Paris, in 1923 wrote in considerable detail on this subject, and this congenital deformity is now labeled the "Pierre Robin syndrome."

Early attempts at overcoming this condition included positioning of the infant face down and allowing the tongue, by its own weight, to fall forward, thus re-

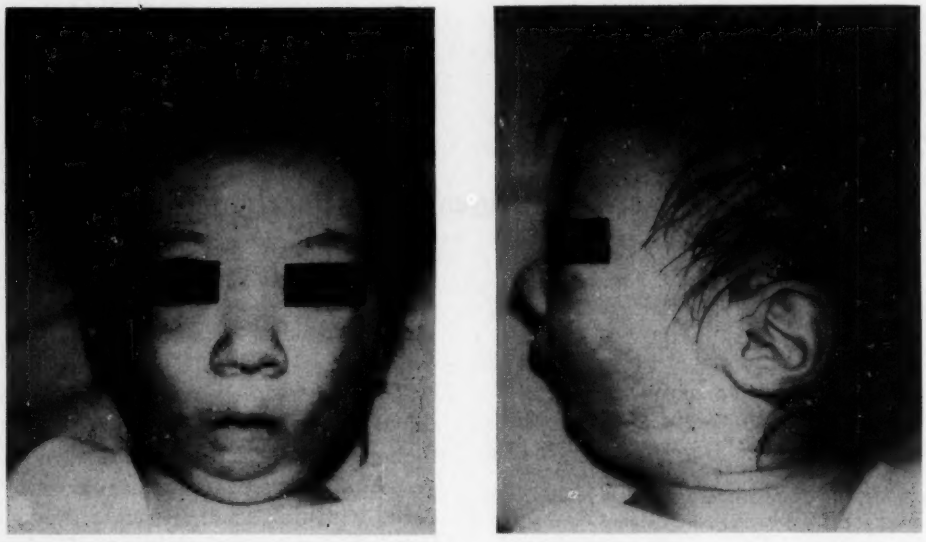

Fig. 1—Patient with congenital micrognathia and microstomia, fed through gastric fistula for eight months

lieving the respiratory obstruction. However, this frequently resulted in failure and death, and other methods were employed. These included the use of head braces to exert pressure on the angles of the mandible to hold it forward, silver wire passed around the mandible and traction applied to hold it forward, and metal plates placed over the base of the tongue to draw it forward by means of a wire through the substance of the tongue. In 1933 Davis and Dunn[3] introduced an upper lip guard which was attached to the nursing bottle. This appliance forced the infant to thrust the lower jaw forward in nursing. Through this muscular exertion, forward growth of the mandible was thought to result.

Although Shukowsky first employed the tongue-to-lip suture in 1902, the procedure failed to gain general recognition and use until 1946 when Douglas[4] perfected the operation in which the tongue is sutured to the inside of the lower lip to create permanent adhesions between these two structures. By this method the prolapsed tongue was held in a forward position as it was stretched over the alveolar ridge by its attachment to the lower lip. This method is now universally accepted and is known as the Shukowsky-Douglas operation (Fig. 2).

■ *Etiology*

It is not known why the mandible fails to grow in utero, although it has been shown that after birth, once the mandible starts to develop, it usually proceeds to normal contour and size. Evidence collected by Brodie[5] indicates that the progressive downward and forward growth of the mandible in micrognathic infants can be expected to correct the receding chin by the age of four to six years. There is

Fig. 2—Tongue sutured to lower lip

no evidence to indicate that a permanent receding chin is to be expected. Of 16 cases studied at Los Angeles Children's Hospital and followed up, there has been normal mandibular development in all[6] (Fig. 3).

None of the factors which may inhibit mandibular growth are present in these infants. Roentgenograms show only a small mandible and normal condyles.

Moderate normal variations in the forward position of the chin result from genetic tendencies. Severe retrusion of the mandible in adults occurs, however, only when the condylar growth centers are absent or are injured by trauma or infection during their normal growth period.

With a bilateral arrest in condylar growth during the early growth period, there is usually a symmetrical lack of

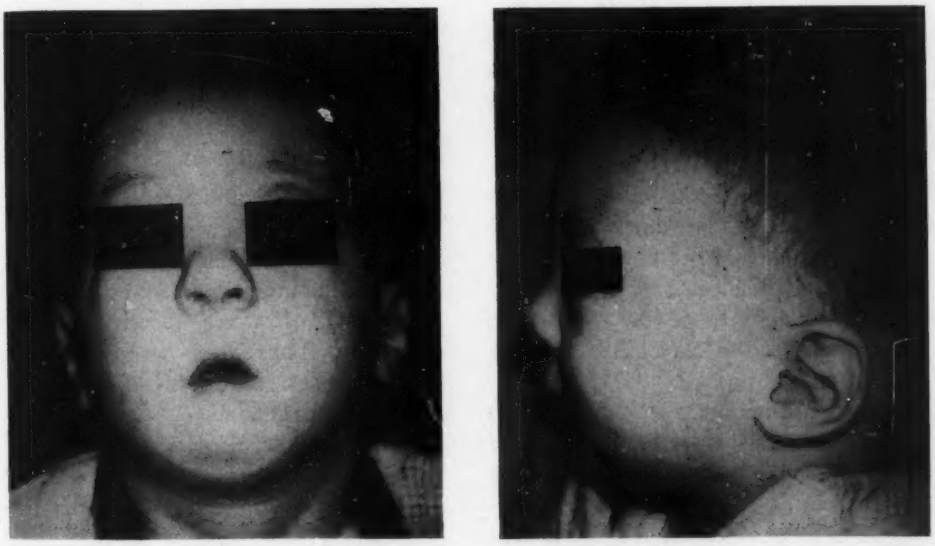

Fig. 3—Views of same patient as in Figure 1. Note improvement in mandibular contour

Fig. 4—Views of nineteen year old patient with history of severe bilateral otitis media at age four

growth of the mandible. This is characterized by the bird-face appearance, which was referred to previously. There is a noticeably short mandible with the chin retruded to about the level of the hyoid bone, and the teeth are malposed, impacted, and unerupted; some of the teeth may be in the ramus.

Any local interference, such as trauma, inflammation or radiation, which will affect the condylar growth center, will alter the orderly progression of development and will result in some type of mandibular deformity (Fig. 4).

Trauma as an etiologic factor may be:

1. Birth trauma.
2. Trauma to the joint directly or to the chin with force to the temporomandibular joint.

The following types of inflammation may cause mandibular deformity:

1. Spread of regional infection (dental infection included).
2. Otitis media.
3. Osteomyelitis (either local or hematogenous).

Radiation damage may consist of the following:

1. Direct radiation damage to the region.
2. Damage resulting to offspring whose mothers received roentgen-ray irradiation for hemorrhage, myoma, or carcinoma of the uterus, while pregnant. Several such cases are reported in the literature. They were associated with microcephalus, micro-ophthalmus, and deficiency in dentition.

Dietary deficiencies also may be etiologic factors. A number of articles deal with the effects on the growing mandibular condyles of vitamin deficient diets and excessive or deficient amounts of hor-

mones, which show that there is a directly proportional relation between deficiencies and growth in all parts of the face.

■ *Treatment*

When the patient is suffering from ankylosis of the temporomandibular joint, the first objective is to re-establish the mobility of the mandible. The operation consists of making a space of 6 to 8 mm. between the temporal bone and the superior portion of the ramus. This space is then filled with fascia lata. In bilateral ankylosis no attempt is made to operate on both sides simultaneously. If both joints are operated on at the same time, the pull of the elevator muscles is likely to close the space. An interval of two to three months between operations is desirable to give the operative site time for consolidation.

Many types of operations to correct this condition surgically have been described in the literature. All of them, however, accomplish essentially the same result. The purpose of the operation is to advance the chin forward by means of a sliding or step osteotomy. This may be an L,[7] a Z-shaped,[8] or a diagonal cut[9] either through the ramus or body of the mandible. This procedure results in considerable improvement, but in severe cases, additional measures are necessary in order to add contour and bulk to the symphysis region of the chin.

Various types of grafts and implants have been employed for contour restoration of the chin. These include both living tissues of cartilage and bone and inert materials. Although foreign materials are tolerated by the tissues for a variable period of time, when they are subjected to functional stress, they are often rejected by the body.

Cartilage has been used in many of the reconstructive operations for the correction of microgenia. This includes autogenous, homogenous and heterogenous types. Millard[10] reports cases in which he has used both preserved human rib cartilage and preserved bovine cartilage with good results. The operation consisted of an intraoral onlay type implant, using a contoured, solid piece of cartilage. Cohen[11] reported the use of diced autogenous cartilage for contour restoration. In his procedure, five to seven pockets were made in the subcutaneous tissue of the chin and the diced cartilage was forced into them. This apparently gives the chin a softer feel than that obtained with a hard, solid implant. Trauner and Obwegeser[8] reported using a retrocondylar cartilage implant to force the mandible forward out of the glenoid fossa. Smith and Robinson[12] reported an L-shaped, sliding osteotomy in the sub-mandibular notch with a cartilage implant to the chin.

Preserved homogenous cartilage, although a foreign body, seems to be well tolerated by the body, but autogenous cartilage is much more suitable. The disadvantage of these implants is that they are apt to become displaced because of the movement of surrounding tissues.

Heterogenous cartilage implants have not proved very successful in this type of reconstructive surgery.[13] Craigmyle[14] reported an analysis of 205 grafts of preserved heterogenous (bovine) cartilage. In his report, clinical and histological evidence showed that although the early results may appear promising, the chances of later disappointment for both patient

and surgeon are such that the use of bovine cartilage as a routine material for the restoration of contour should be discontinued.

Human bone has been used in many of these implants with good results. Kazanjian[15] reported on a sliding osteotomy in the body of the mandible with the addition of an iliac bone graft to the chin. Bone is not as easily shaped as cartilage, but when placed in contact with living bone it consolidates and becomes an integral part of the bony framework.

Both autogenous and homogenous bone have been used successfully, but the preference is almost universally for autogenous bone when practicable. Peer[16] found, in responses to a questionnaire sent to a selected group of orthopedic, plastic and neurosurgeons, that all preferred autogenous bone grafts and used homogenous bank bone only when it was not expedient to use autogenous grafts.

Converse[17] reported that he had successfully performed 26 genioplasties with bone and cartilage inserted through the oral vestibular route. Three of these were from the bone bank of the hospital. He states that such grafts are as successful as those placed through external incisions, if careful asepsis is maintained.

Gelatinized bone[18] has been used in 18 instances of facial reconstruction; in 11 of these instances there were mandibular deformities. Gelatinized bone is prepared by grinding bone into 1 mm. size and mixing it with the patient's whole fresh blood and powdered absorbable gelatin sponge. This gelatinous mass then may be placed through an incision or injected under the periosteum.

Polyethylene has been very useful in facial reconstruction. The advantage of this material is that it can be precision formed to the area of implantation, and since it is possible to feather the edges, a smooth, accurately fitting implant is formed.

Shevick[19] used polyethylene in 20 instances and claimed that it was far superior to other types of implants. Rubin and Walden[20] made a seven year study of polyethylene implants to all parts of the face. Of a total of 135 implants during this study, only 22 were removed. Of 19 chin implants, none were removed.

Buried metal prostheses have been advocated by Walsh.[21] In his series of implants, Ticonium was used.

Tantalum is biologically inert and may be implanted without an inflammatory reaction's taking place. Bellinger[22] described the use of tantalum wool for the building out of defective facial contour. Because of its innate properties, and because it becomes completely incorporated in the subcutaneous tissues, this substance appears to be useful for the correction of microgenia. Tantalum gauze[23] is supplied in the form of a sheath or tube which is boiled or autoclaved before the operation. The gauze is placed in the operative site and molded by finger pressure into the desired shape. It is then attached by means of tantalum sutures taken through the periosteum.

Gross and Gold[24] found in a series of experiments with Vitallium and Austanium implants that there was complete compatibility of the metal implants and the surrounding bone and soft tissues. The laboratory animals used in the experiment were sacrificed over a period of from 2 to 17 months. There were signs of in-

flammatory reaction, and the screws and plates were shiny and unchanged. The screws were not loose and had to be removed with a screw driver. In these experiments, however, the plates were placed on healthy, normal bone and did not bridge fracture sites or bone defects.

Prosthetic appliances, such as complete and partial dentures, may also be used for additional contour of the lips and chin when indicated.

■ *Summary*

1. Micrognathia may be either congenital or acquired. The congenital form usually corrects itself with advancing age. The acquired form is the result of injury to the condylar growth centers and results in permanent deformity.

2. The defect can be corrected to a certain extent by surgery.

3. Additional contouring procedures are usually needed at the symphysis region of the chin.

4. The implant materials may be cartilage, bone or inert materials.

5. Autogenous cartilage and bone implants appear to be the most successful of the living tissues used.

6. Heterogenous cartilage gives disappointing results.

7. Polyethylene has given excellent results in this type of reconstructive surgery.

8. Prosthetic appliances are useful for additional contour of the lips and chin.

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1. Shukowsky, W. P. Zur Ätiologie des Stridor inspiratorius congenitus. Jahrb. Kinderhk. 73:459, 1911.

2. Robin, P. Backward lowering of the root of the tongue causing respiratory disturbances. Bul. Acad. méd., Paris 89:37 Jan. 2, 1923.

3. Davis, A. D., and Dunn, R. Micrognathia: suggested treatment for correction in early infancy. Am. J. Dis. Child. 45:799 April 1933.

4. Douglas, Beverly. Treatment of micrognathia associated with obstruction by a plastic procedure. Plast. & Reconstr. Surg. 1:300 Nov. 1946.

5. Brodie, A. G. On the growth pattern of the human head, from the third month to the eighth year of life. Am. J. Anat. 68:209 March 1941.

6. Kiskadden, W. S., and Dietrick, S. R. Review of treatment of micrognathia. Plast. & Reconstr. Surg. 12:364 Nov. 1953.

7. Kazanjian, V. H. Mandibular retrusion with ankylosis of the temporomandibular joint (report of two cases). Plast. & Reconstr. Surg. 17:91 Feb. 1956.

8. Trauner, Richard, and Obwegeser, Hugo. Surgical correction of mandibular prognathism and retrognathia with consideration of genioplasty. II. Operating methods for microgenia and distoclusion. Oral Surg., Oral Med. & Oral Path. 10:787 Aug. 1957.

9. Barsky, A. J. Principles and practice of plastic surgery. Baltimore, Williams & Wilkins Co., 1950.

10. Millard, D. R., Jr. Chin implants. Plast. & Reconstr. Surg. 13:70 Jan. 1954.

11. Cohen, S. Some suggestions in cosmetic rhinoplasties and microgenia. Plast. & Reconstr. Surg. 11:435 June 1953.

12. Smith, A. E., and Robinson, M. Symposium on maxillofacial surgery. Submandibular notch sliding osteotomy for surgical correction of mandibular retrusion; new technique; preliminary report. Am. J. Surg. 85:606 May 1953.

13. North, J. F. Use of preserved bovine cartilage in plastic surgery. Plast. & Reconstr. Surg. 11:261 April 1953.

14. Craigmyle, M. B. L. Studies of cartilage autografts and homografts in the rabbit. Brit. J. Plast. Surg. 8:93 July 1955.

15. Kazanjian, V. H. Symposium on maxillofacial surgery. Temporomandibular joint ankylosis with mandibular retrusion. Am. J. Surg. 90:905 Dec. 1955.

16. Peer, L. A. Autogenous bone transplants in humans. Plast. & Reconstr. Surg. 13:56 Jan. 1954.

17. Converse, J. M. Restoration of facial contour by bone grafts introduced through the oral cavity. Plast. & Reconstr. Surg. 6:295 Oct. 1950.

18. Mayer, D. M., and Swanker, W. A. Gelatinized bone; its role in maxillofacial surgery. Am. J. Surg. 88:881 Dec. 1954.

19. Shevick, B. B. Precision-formed polyethylene implants for correction of mandibular contour. Am. J. Surg. 92:538 Oct. 1956.

20. Rubin, L. R., and Walden, R. H. Seven year evaluation of polyethylene in facial reconstructive surgery. Plast. & Reconstr. Surg. 16:392 Nov. 1955.

21. Walsh, T. S., Jr. Buried metallic prosthesis for mandibular defects. Cancer 7:1002 Sept. 1954.

22. Bellinger, D. H. Preliminary report on the use of tantalum in maxillofacial and oral surgery. J. Oral Surg. 5:108 April 1947.

23. Thoma, K. Oral surgery, ed. 2. St. Louis, C. V. Mosby Co., 1952.

24. Gross, P. P., and Gold, Lionel. Compatibility of Vitallium and Austanium in completely buried implants in dogs. Oral Surg., Oral Med. & Oral Path. 10:769 July 1957.

Nasomandibular fixation: treatment of jaw fractures in edentulous patients

■ *Andrew M. Linz, D.D.S., M.Sc. (Dent.), and Jerome Friedman, D.D.S., New York*

Fixation and immobilization of fractured edentulous mandibles present unusual problems. A simple method eliminating extraoral appliances may be utilized by circumferential wiring of the patient's lower denture to the mandible and establishing fixation by a nasomandibular wire. Five cases are reported in which this technic was employed with satisfactory results.

The object of treating fractures of the maxillae is to realign the fragments, in order to re-establish proper functioning of the jaws. In most instances, realignment can be accomplished routinely by intermaxillary wiring; in patients who have lost their teeth, however, the procedure of reducing the fracture and restoring proper function is more difficult.

The purpose of this paper is to describe and recommend nasomandibular fixation as a simple and effective means of treating fractures in the edentulous patient. When a fracture is reduced and fixed by use of this technic, the wiring is completely intraoral, thus eliminating the use of headcaps and other extraoral appliances. This makes it possible, in most instances, for the patient to carry on his usual activities. Reduction and wiring by this method is accomplished in conjunction with intraoral splints or with the patient's dentures. Similar technics have been described by Thoma,[1] Rowe and Killey,[2] and others.

At the Roosevelt Hospital's department of oral surgery, we have treated fractures of edentulous and partially edentulous patients. The first three cases reported are examples of successful treatment of edentulous patients, by the use of nasomandibular fixation.

■ *Report of Cases*

CASE 1—A 58 year old edentulous man, who had no oral prosthesis, was admitted to the hospital with the chief complaint of a swollen jaw. The patient reported that the swelling was of one day's duration, and he vaguely recalled having received a blow to his jaw on the previous day while he was inebriated.

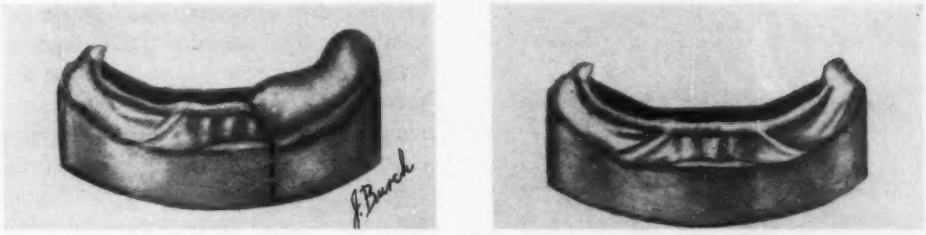

Fig. 1—Case 1. Left: Line shows where cast is to be broken. Right: Model after proper realignment

Physical examination showed swelling in the regions of the right mandibular angle and the left side of the chin. The patient was conscious, but he was not too alert and his reflexes were slow. He had considerable respiratory difficulty, and a prophylactic tracheostomy was performed by the admitting surgeon in the accident room, with the patient under local anesthesia. Roentgen-ray examination revealed fractures of the mandible in the right angle and left side of the chin. He was transferred to the department of oral surgery for definitive treatment 48 hours after admission.

The patient was operated on three days after admission. He was anesthetized by the use of thiopental sodium, administered intravenously, and nitrous oxide-oxygen via the tracheostomy tube. In the region of the fracture of the right angle, an open reduction was performed extraorally. Two stainless steel wires (0.22 gauge) were placed in a crossed position transosseously; the fragments then were approximated and fixed in proper position. The incision was closed subcutaneously with catgut sutures, and cutaneously with black silk sutures.

In the left side of the chin the fracture was exposed intraorally. Two stainless steel wires (0.22 gauge) were placed in a crossed position transosseously; the fragments were approximated and fixed in proper alignment, and the incision was closed with black silk sutures.

The patient was maintained on antibiotic therapy and supportive medical treatment. The healing of the fracture at the right angle progressed uneventfully, but complications arose with the fracture in the region of the left side of the chin. Because of the lack of proper fixation, the alignment achieved at the time of surgery was not maintained, and the posterior fragment rotated laterally and cephalad. It was then decided that intraoral splints were necessary. Primary impressions of the dental arches were taken, in compound, from which secondary impression trays were constructed. With the use of zinc oxide-eugenol paste, final impressions were taken, and stone models were constructed. The mandibular cast was broken at the site of the mental fracture (Fig. 1, left) and brought into proper alignment. The mandibular splint was constructed to conform to this re-formed model (Fig. 1, right). Wax bite-blocks were made, vertical and centric relationship was established by using the right side of the mouth to obtain proper measurements, and acrylic splints were constructed.

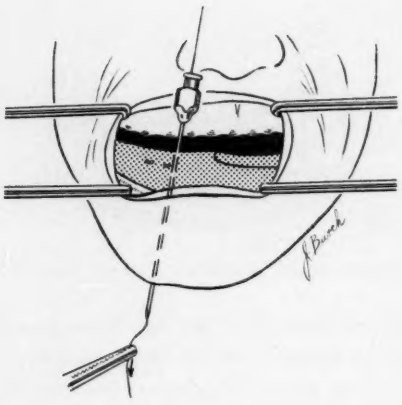

Fig. 2–Case 1. Spinal needle on lingual aspect of mandible, and wire passing through needle

In the meantime, the patient developed ischuria and was referred for treatment to the urology service. After three weeks, the urological symptoms subsided and it was decided to insert the intraoral splints. The tracheostomy tube had been removed by this time, and general anesthesia was achieved by means of thiopental sodium, administered intravenously, and nitrous oxide and oxygen, by the nasal intratracheal route.

The skin over the submaxillary region was prepared in the usual manner. Intraorally, the vestibular, as well as the lingual, areas were painted with tincture of thimerosal. The site of the fracture in the left mental region was exposed intraorally. The fibrous tissue in the region was removed, and both ends of the fracture were freshened with the use of a rongeur forceps and bone files. The mucosa was then approximated with interrupted catgut sutures. Both splints were sterilized in a benzalkonium chloride solution, and the mandibular splint was placed into position. A no. 17 gauge soft spinal needle, bent slightly in order to follow the curvature of the mandible, was then placed on the lingual aspect of the mandible, in the right side of the chin, in contact with the lingual surface of the splint. The needle was kept in contact with the lingual cortical plate of bone, and was passed downward until the outer skin was penetrated beneath the inferior border of the mandible. The stainless steel wire (0.22 gauge), which had been sterilized previously, then was passed through the needle and secured with a clamp (Fig. 2). The needle was removed and placed on the labial side of the mandible, alongside of the splint and opposite to the site of its previous insertion; it was then passed downward toward the inferior border of the mandible, in contact with the cortical plate of bone, making its exit at the site of the previous perforation, in order to minimize the amount of scar formation in the region. The end of the wire, which was secured with the clamp,

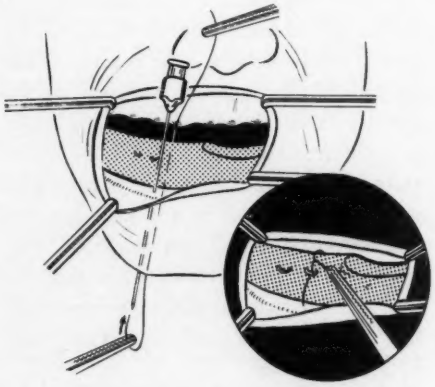

Fig. 3–Case 1. Wire being passed up through needle. Insert shows circumferential wiring being tightened

was released and passed up through the needle in its present position (Fig. 3). The needle then was removed, and both ends of the wire were secured and twisted until the wire was tightened but not completely taut (Fig. 3, insert).

The entire procedure was performed in three positions on the mandible; namely, in the region of the right side of the chin, in the region of the symphysis, and in the left side of the chin, posterior to the fracture. The circumferential wire in the region of the symphysis was secured tightly, and the excess was removed. The wires were then pulled tightly around the mandible in direct contact with the bone. As the wires were being tightened, external pressure from the occlusal portion of the mandibular splint and the submaxillary region was used to reduce the fragments. A simple gauze dressing was placed over the perforations in the submaxillary region and was left in position for one day.

The next step in the nasomandibular technic was the insertion of wire through

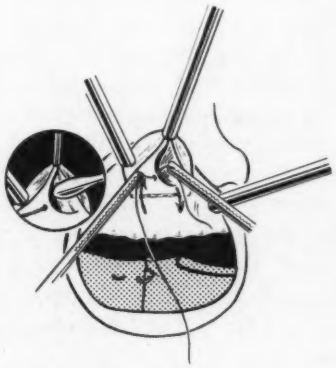

Fig. 4—Case 1. Insert shows periosteal elevator reflecting nasal mucosa, and drill in position. Figure 4 proper shows wire passed through aperture and recovered with hemostat forceps

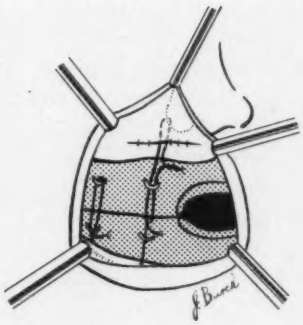

Fig. 5—Case 1. Splints wired in position

the nasal process of the maxilla. The maxillary splint was placed into position. An incision was made above the labial flange of the splint in the mucolabial fold, on one side of the labial frenum. A local anesthetic, with a vasoconstrictor, was infiltrated into this region, in order to keep the bleeding at a minimum and to obtain a clear operative field. An incision, 2.5 cm. in length, was made and carried through the mucoperiosteum. The resulting flap was reflected upward by the use of a periosteal elevator, and the edge of the pyriform aperture was exposed. The nasal mucosa was dissected from the lateral surface of the nasal process, and retracted. The periosteal elevator was used to reflect the mucosa of the nose and to prevent the drill from slipping when the bone was perforated (Fig. 4, insert). With a small hand drill, an aperture was made in the upper part of the curve of the nasal process of the maxilla, approximately 1 cm. over the angle of the nasal aperture and 0.5 cm. from the edge of the process.

A stainless steel wire was passed through the aperture from the exterior, and while the retractor was still in posi-

tion, the wire was recovered with a hemostat forceps (Fig. 4). The incision was closed with interrupted black silk sutures, and the same procedure was repeated on the opposite side of the labial frenum. The nasal wires were then looped through the circumferential wires of the mandible on both sides, and secured with a hemostat. The circumferential wires were tightened completely, after which the nasal wires were tightened. A stainless steel wire (0.25 gauge) was passed through the eyelets of the maxillary and mandibular splints, securing them both into position and preventing any lateral movement (Fig. 5). Postoperative roentgenographic examination showed good alignment of the fracture. Another roentgen-ray examination, seven weeks later, revealed a good healing process, allowing the splints to be removed. The removal of the nasal and circumferential wires required only local infiltration anesthesia.

CASE 2—A 43 year old man, partially edentulous, was admitted to the hospital with the chief complaint of soreness on chewing, and swelling over both condyles. The patient reported that he had received a blow to his chin eight hours prior to admission.

Physical examination showed that the patient had no injuries except to the lower jaw. He was edentulous in the maxilla, and in the mandible, he had retained only the right and left cuspids. He wore a complete maxillary denture and a mandibular partial denture. Roentgen-ray examination revealed a fracture of both condyles.

The central and lateral incisors were removed from the dentures in order to facilitate postoperative feeding. By the use of the same procedure as employed in the first case, the dentures were wired into position and used as splints. This procedure was performed with the patient under general anesthesia by means of thiopental sodium administered intravenously and nitrous oxide and oxygen administered by means of a nasal intratracheal tube. The patient recovered satisfactorily and was discharged three days postoperatively. Roentgenographic examination six weeks later revealed good healing, which permitted the wires to be removed.

CASE 3—A 54 year old edentulous man was admitted to the hospital, with the chief complaint of inability to chew without resulting pain. The patient reported that he had received a blow to his jaw the day before admission. Physical examination showed him to be in good health. He wore complete maxillary and mandibular dentures. Roentgenographic examination revealed a fracture of the left angle, right body and right condyle of the mandible.

The incisors were removed from the dentures, which were used as splints and while the patient was under general anesthesia were wired into position by the same procedure used in the first two cases. The patient's recovery was satisfactory, and he was discharged two days postoperatively. Roentgenographic examination six weeks later revealed a good healing process (Fig. 6), and the wires were removed.

COMMENT — Our experience with these three edentulous patients shows

how, in treating fractures, nasal wiring can be used successfully in conjunction with circumferential wiring of the mandible. This technic is also useful in the treatment of fractures in patients who have a few teeth but who do not have the complement of teeth essential for intermaxillary wiring. In such instances the nasal wiring is performed in the same manner as described previously. In the edentulous patient the nasal wire is looped through the circumferential wire of the mandible. In the partially edentulous patients to be described (Case 4 and 5), a Jelenko arch bar was applied to the remaining mandibular anterior teeth, and the nasal wires were passed around the bar and secured.

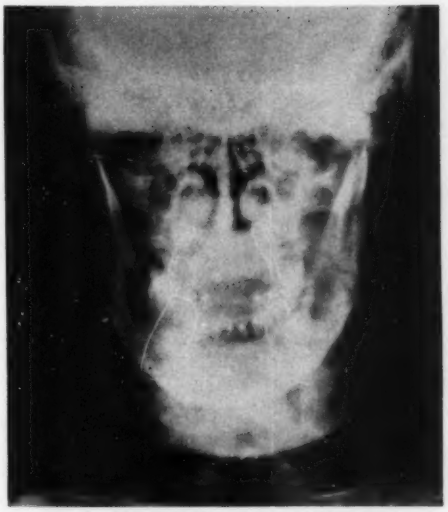

Fig. 6—Case 3. Posteroanterior view. Nasomandibular wires in position six weeks after fixation

CASE 4—A 32 year old man, partially edentulous, was admitted to the hospital, with the chief complaint of pain and swelling of the left side of the mandible. He reported that he had received a blow to his mandible on the same day of admission.

On physical examination the patient displayed no evidence of any other injury. Oral examination revealed extensive caries in the mandibular bicuspids on the left side, with periapical involvement of the bicuspids on the opposite side. The patient wore a complete upper denture. Roentgenographic examination revealed a comminuted fracture of the left body and a transverse fracture of the symphysis that involved only the superior portion of the mandible.

With the patient under general anesthesia (thiopental sodium and nitrous oxide and oxygen), the involved bicuspids were extracted and a Jelenko arch bar was placed on the remaining mandibular anterior teeth. The maxillary denture then was inserted, and the same procedure was used for fixation as in the preceding cases. Postoperative roentgenographic examination revealed the fragments to be in good alignment. The patient made a satisfactory recovery and was discharged on the third postoperative day. Six weeks later, roentgenographic examination revealed a good healing process (Fig. 7), and the wires were removed.

CASE 5—A 40 year old woman, partially edentulous, was admitted to the hospital, with the chief complaint of pain and swelling in the left condylar region of the mandible. The patient had been involved in an automobile accident on the day of admission. Physical examination showed her general health to be good, and she had no other bodily injuries. Oral

Fig. 7—Case 4. Lateral-oblique view. Nasomandibular wires in position six weeks after fixation

examination revealed extensive caries on the mandibular left bicuspid and molars. There was also an absence of teeth, uncompensated by prosthesis, in the posterior right mandibular region and in both posterior maxillary regions. Roentgenographic examination revealed a fracture of the left condyle and in the region immediately to the right of the symphysis of the mandible.

While the patient was under general anesthesia with the use of thiopental sodium and nitrous oxide and oxygen, the carious teeth were removed, and a Jelenko arch bar applied to the remaining anterior mandibular teeth. The same technic of fixation as used in the preceding cases was utilized to reduce and stabilize the fractures. The firmness of the remaining anterior teeth was sufficient to hold the fragments in good alignment, and postoperative roentgenograms revealed them to be in good position. Recovery was satisfactory and the patient was discharged on the fourth postoperative day. Six weeks later, roentgenographic examination revealed satisfactory healing, and the wires were removed.

■ *Summary and Conclusions*

Five cases involving fractures of the mandible in which nasomandibular fixation was used have been reported. This intraoral procedure gave adequate fixation of the fractures in all instances. Two of the patients were edentulous; in one, intraoral splints were constructed, and in the other patient, his own dentures were used.

Of the other three patients, one was partially edentulous in the maxilla and mandible, and the other two were edentulous in the maxilla and partially edentulous in the mandible. In two of these patients, their own dentures were used in the stabilization of the fractures; in the third, the patient's remaining anterior teeth were used to achieve proper stabilization of the fracture.

This procedure proved to be relatively simple and efficient, and not too time consuming. As indicated, the technic provided good fixation of the fractures and eliminated the need for extraoral appliances. It caused minimal scarring, and general recovery in all instances was highly satisfactory. It was possible to construct splints for those patients whose absence of teeth was not compensated by oral prosthesis. The wiring was easy to remove after completion of the treatment.

From the department of oral surgery, Roosevelt Hospital.

1. Thoma, K. H. Oral surgery, vol. 1, ed. 2. St. Louis, C. V. Mosby Co., 1952, p. 686-690.

2. Rowe, N. L., and Killey, H. C. Fractures of the facial skeleton. Baltimore, Williams & Wilkins, 1955, p. 193.

Fundamentals of electrosurgery

■ *Maurice J. Oringer, D.D.S., New York*

Failure to understand the physical principles as well as the clinical technics of electrosurgery has prevented much of the dental profession from utilizing this most effective instrument. In an effort to inform the profession of the advantages of electrosurgery, a detailed account is given of the types and uses of electrosurgery, and the basic electrical physics which govern the production of the different surgical currents. The subject of electrosurgery should be made a part of the undergraduate and postgraduate curricula.

Surgical use of electrically generated heat energy is not a recent development, misconceptions to the contrary notwithstanding. Almost two centuries have elapsed since electrocautery was first utilized as a therapeutic agent at two London hospitals, the Middlesex and St. Bartholomews. During this period a considerable variety of electrical devices have been designed for medical use. Unsatisfactory ones have long since become obsolete; useful ones have been progressively improved and refined. Most current electrosurgical instruments are indispensable assets to the modern surgical armamentarium.

Electrosurgery was pioneered from the outset, and for a long time used exclusively, by tumor surgeons. The merits of this new modality gradually became more widely appreciated, and eventually other medical specialists, notably dermatologists, rhinolaryngologists and gynecologists adapted it to their respective needs. Electrosurgery today is highly regarded by the entire medical profession and plays a valued vital role in modern medical practice.

It has been amply demonstrated that when properly and judiciously employed, electrosurgery is also an extremely valuable and versatile adjunct to modern dental practice. However, despite the earnest efforts of a dedicated few who have striven to alert the profession to the potential benefits to be derived from its diversified uses in dentistry,[1-6] the profession as a whole regrettably has failed to exploit its full potential. And, since most nonusers appear to be either uninformed or misinformed about electrosurgery and its pertinent nomenclature, it is scarcely surprising that many otherwise well-informed dentists still labor under antiquated misapprehensions and misconceptions about electrosurgery and fail to recognize its

effectiveness, potential range of usefulness, and safety when it is properly employed.

Occasional reports of acute periostitis, tissue sloughing, and similar unfavorable sequelae after use of electrocautery or misuse of electrosurgery for dental procedures also have been a contributing deterrent influence.[7] The reports usually manage to imply that electrosurgery is inherently dangerous and unsuited for dental use, and that unfavorable results are inevitable. Such false implications serve to camouflage the real reason for such failures—the shortcomings of individual operators.

It is my conviction that the reasons for failure invariably are twofold: poor choice of electrosurgical currents, or faulty electrosurgical technic, or both. The former can be attributed to operators' failure to acquire clear understanding of the basic fundamentals involved in electrosurgery and on which it operates. The latter results either from lack of competent training in electrosurgical technic, or inability to conceive and competently execute practical clinical technics due to lack of knowledge of the afore-mentioned fundamentals.

With a background of sound knowledge of the basic principles, it may be possible to overcome the handicap of lack of formal training and develop good technic by diligent practice and close observation. But without this background, neither practice, observation, nor supervised training can assure ultimate competency. This paper, therefore, is concerned primarily with the fundamentals of electrosurgery. Its aim is twofold: first, to eliminate some of the existing misconceptions and confusions by comprehensive review of the basic fundamentals that are all-important, and secondly, to try to stimulate more universal interest in the dental uses of electrosurgery by evaluating the various electrosurgical currents and their tissue responses, and enumerating some of the advantages electrosurgery offers dentistry.

In the broadest sense, electrosurgery might be interpreted as application of electrically generated heat energy to the body to alter or destroy tissue. Theoretically, therefore, any electrical device with which the heat energy can be applied to the body might also be broadly considered an electrosurgical instrument. For all practical purposes, however, such broad vague generalizations are unrealistic and inaccurate, and contribute to the existing confusion.

For an electrical device to qualify as an electrosurgical instrument from the practical standpoint, it must offer much more than the mere ability to alter or destroy tissue; it must operate on high-frequency alternating current (for reasons that shall become obvious), and it must meet certain specific minimum criteria and requirements. It must permit the operator to control and limit the extent of tissue alteration or destruction; it must permit him to regulate the quality and intensity of the current output at all times; it must permit him to perform precise, accurately demarcated surgery, and then finally, it must permit desirable tissue repair.

Surgical electric devices, therefore, fall into two categories: electrocautery and electrosurgical instruments.

Electrocautery instruments are elec-

trical devices which fail to meet any of the requirements listed earlier.

Electrosurgical instruments are electrical devices which fulfill the requirements to greater or lesser degree.

Both categories are capable of altering or destroying tissue, and both function by virtue of electrically generated heat energy applied to the body. All similarity ends there. The respective patterns of behavior and effects on tissue of the two categories are totally unlike and unrelated. These should never be used or classified interchangeably.

■ *Electrocautery*

The earliest and most primitive electrical device used for therapeutic purposes was the electrocautery. This device consists of a step-down transformer which converts ordinary house electric current into a low voltage output, which in turn energizes a wire electrode that can be applied to the tissues. Like its even more primitive predecessor, the hot cautery iron, the electrocautery electrode becomes heated to a red or white hot glow. When the hot electrode comes into contact with the tissues its incandescent heat passes by convection (searing heat) outward from the electrode into the surrounding tissues. Tissue cells affected by the incandescent heat undergo coagulation necrosis identical to that produced by any other type of severe burn. Tissue repair also is identical; that is, by contractile cicatricial scar formation. The operator cannot control effectively or limit the extent of tissue destruction that ensues. Electrocautery literally cooks the tissues. Tissue removed by electrocautery therefore cannot be histologically differentiated for diagnostic interpretation. Electrocautery is totally unsuited for precise, demarcated surgery of any kind. It is not, and should not be considered as, an electrosurgical instrument or procedure.

■ *Electrosurgery*

In order to use electrosurgery profitably it is necessary to understand thoroughly everything pertinent to it starting with the basic principles on which it operates, and all the qualities and factors that govern its performance.

PRINCIPLES—The principles are based on d'Arsonval's discovery in 1890-1891 that muscular contractions cease when alternating current in excess of 10,000 oscillations per second (high-frequency current) is applied to living tissue. Electrosurgery is based on the principle that when high-frequency current is passed through the body, nervous and muscular responses are avoided and the only result is production of heat. The heat results from resistance offered by the body tissues to passage of the current. This is the basic principle upon which both medical and surgical diathermy are founded. The latter is better known by the term electrosurgery.

WAVEFORM—Alternating current has certain inherent characteristics that must be understood. It is an oscillating current. The single cycle of alternating current is visualized in Figure 1. As the current oscillates it reverses its direction of flow from several times to millions of times per second. The current may be unrectified, partially rectified, or fully rectified. Each of these types of alternating current

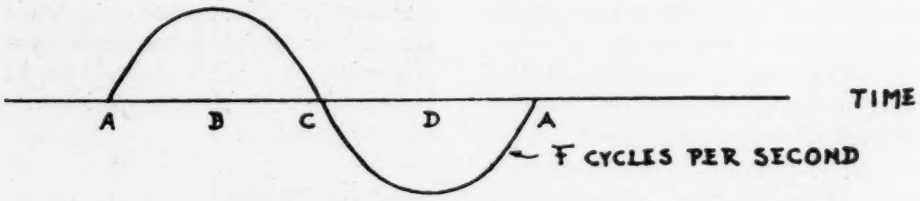

Fig. 1—Schematic diagram of single cycle of alternating current

produces a particular pattern of current flow called a waveform. These waveforms are wavy lines which can be visualized in the oscilloscope or traced on the oscillograph. It is believed that the different tissue responses elicited by electrosurgical currents are due to the differences in waveform these various currents create. Unrectified current produces a highly damped waveform; partially rectified current has a moderately damped waveform, and fully rectified current produces an undamped waveform. The differences and characteristics of the various waveforms will be more fully elaborated and evaluated later in the text.

ELECTRODES—When high-frequency currents are introduced into the body by means of electrodes, diathermic or electrosurgical effects are produced.

There are two basic types of electrode. One is the large electrode which is the passive or dispersive one called the indifferent plate. The other is the small electrode which is the active, working, or surgical electrode.

When electrodes of equal or near-equal size are employed, the current radiates between the two electrodes and the density of this current is evenly dispersed within the intervening tissues. This produces a generalized temperature rise adequate for medical diathermy, but without sufficient concentration of heat energy to cause cellular destruction. But when one electrode is large, and the other small enough, the current is no longer evenly dispersed between them. This current radiates through the tissues from the large electrode toward the smaller one, and, at the site of contact of the latter, attains density or concentration of heat energy sufficient to cause actual cellular destruction; that is, surgical diathermy or electrosurgery.

If only the small electrode is applied to the tissues, all the heat energy potentiated by the current is concentrated at the site of contact, producing a more intensely destructive effect on the tissues.

When both electrodes are employed simultaneously it is called biterminal application. When only the surgical electrode is utilized and the indifferent plate is not employed, it is a monoterminal application.

TISSUE RESPONSES TO ELECTROSURGERY—The basic effects of electrosurgical current are either cellular dehydration or a coagulating effect, or cellular disintegration or volatilizing effect. The electrosurgical effects respectively are:

Electrodesiccation, Fulguration, Electrocoagulation } coagulating currents
Electrosection or cutting—volatilizing current

Desiccation and fulguration are considered by many to be variations of the same current. Their effects on tissue are markedly different; their usefulness in dentistry also is very different. Therefore, they shall be considered as two distinctly separate currents.

Desiccation—When high-frequency current is applied to the tissues monoterminally, the current flows from the surgical electrode directly into the tissues because the patient's body attracts the current to "ground." If the electrode point is inserted into the tissues, it produces deeply penetrating dehydration called "desiccation" (Fig. 2). This current is excellent for heavy hemostasis and deep tissue coagulation. It is rather difficult for the operator to gauge the extent and depth of coagulation with accuracy. This, plus the fact that deep coagulation is rarely necessary or desirable in oral use because of the thinness of the oral mucosa, make desiccation the least useful electrosurgical current for dental purposes.

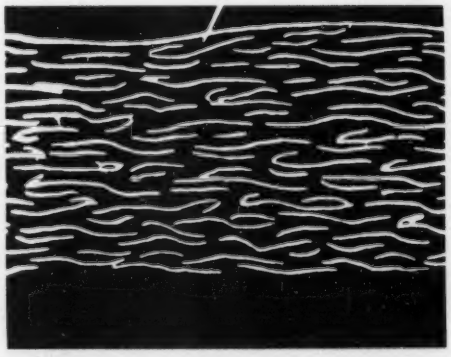

Fig. 2—Electrodesiccation. Electrode inserted into tissues

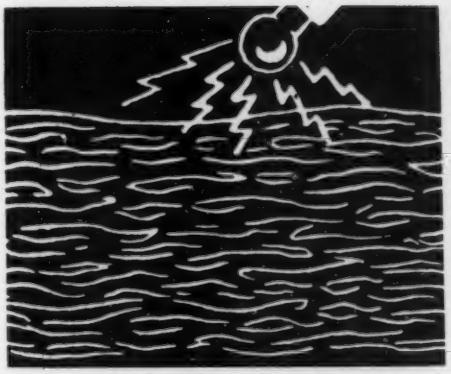

Fig. 3—Fulguration. Sparking between electrode and tissues

Fulguration—When the electrode is held slightly away from the surface of the tissues instead of being inserted into them, the current jumps the gap and sparks, creating superficial tissue dehydration and carbonization called fulguration (Fig. 3). The carbon has an insulating effect and helps to make this current self-limiting to a noteworthy degree. Fulguration can be controlled by the operator and is useful in dentistry for destroying fistulous orifices and tracts, undesirable tissue tabs, and the basal layer of tissue after resection of biopsy specimens.

Electrocoagulation—When highly damped or moderately damped high-frequency current is applied to the tissues by biterminal application, the current density becomes sufficiently concentrated at the site of contact to dehydrate the

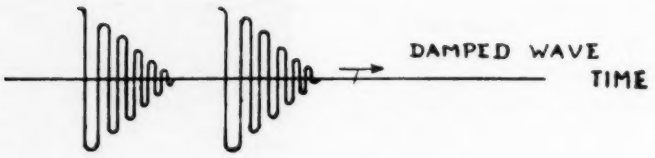

Fig. 4—Diagram of damped wave current from spark gap generator

cells and coagulate their organic contents. The resultant zone of necrosis is confined to the immediate surface of the area to which the current has been applied. The operator can control the extent of tissue destruction by regulating the amount of current flow, the period of electrode contact with the tissues, and by use of sound electrosurgical technic. Electrocoagulation is useful for producing hemostasis and can therefore be employed for the so-called bloodless surgery. It is also useful for coagulating ulcerated surfaces; reducing tissue masses, destroying necrotic tissue and many similar uses.

Since cellular dehydration and coagulation destroys the diagnostic value of tissue, neither desiccation, fulguration nor electrocoagulation are suitable for performing biopsies.

Electrosection — When undamped fully rectified high-frequency current is applied to the tissues by biterminal application and the surgical electrode is moved along the surface as it makes contact, the current density becomes so concentrated along the site of contact that the individual cells in the line of cleavage undergo molecular disintegration and volatilize, creating an incision. This cutting current is known as electrosection. When this current is used properly, the incision is completely free of coagulation, is self-limiting, and fully controllable by the operator. Electrosection is the most widely useful electrosurgical current for dentistry and is invaluable for many dental operative, prosthetic, periodontic and oral surgery procedures.

■ *Electrosurgical Instruments*

The electrical devices designed to produce electrosurgical currents include the following:

THE SPARK-GAP GENERATOR — The spark-gap generator was the earliest and simplest electrosurgical instrument. It operates on the principle of condenser discharge across a spark-gap and produces unrectified current of highly damped waveform similar to that of the single cycle of alternating current.

With each condenser discharge, a series of oscillations are set up. The voltage peak of the first is highest, then each subsequent oscillation of the series diminishes in voltage right down to zero (Fig. 4). This current produces a concentration of heat energy at the site of contact of the surgical electrode sufficient to cause considerable cellular dehydration, and the breaks in the make and break pattern of current flow tends to have a shocking effect on the tissues. When it is used

monoterminally the spark-gap generator produces excellent desiccation and fulguration. Used biterminally it produces electrocoagulation.

ELECTRONIC INSTRUMENTS (radioknives)—With the advent of DeForest's vacuum-tube oscillator or "radio-tube," a new high-frequency current of different waveform was demonstrated. The vacuum-tube oscillator is capable of producing continuous wave oscillation, that is, with equal voltage and without interruptions. This type of current produced an entirely new effect on tissue—it cut.

The prototype of the modern electronic equipment was developed in 1924 by George A. Wyeth, a noted tumor surgeon.[8] His "Endotherm knife" was powered by the DeForest three element vacuum-tube oscillator. Thus this unit as well as its successors have been popularly known as "radioknives."

Electronic surgical instruments vary in design and circuit, and range from single power vacuum-tube units to units built with three or more tubes, transistors or rectifiers. Some units are designed to deliver partially rectified current; others, fully rectified current; still others are built in dual circuits designed to deliver both partially and fully rectified currents. All have one unique common denominator—they can perform electrosection.

SINGLE TUBE UNITS—Single tube units produce partially rectified current which has a moderately damped waveform with a pulsating pattern of current flow (Fig. 4, 5). Although partially rectified current is capable of cutting tissue, it is always accompanied by simultaneous electrocoagulation due to the pulsations which create peaks of heat. This coagulation is much less massive than is that produced by spark-gap current, and can be controlled by the operator with a reasonable degree of accuracy. Nevertheless, since coagulation is undesirable in many dental electrosurgical procedures, these are not the instruments of choice for the dental armamentarium.

FULLY RECTIFIED UNITS—These electronic instruments are built with power vacuum-tubes and either mercury vapor rectifying tubes, transistors, or dry selenium rectifiers, in circuits designed to produce fully rectified current of undamped waveform. This current has a uniformly even, continuous pattern of current flow (Fig. 6, 7) that is nonshock-

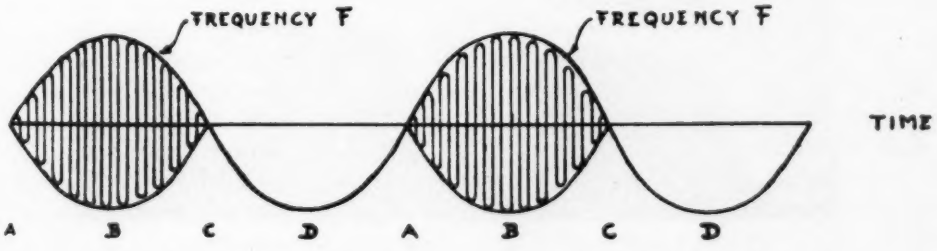

Fig. 5—Diagram of moderately damped waveform of partially rectified alternating current

ing to the tissues and is noncoagulating. When it is properly used, the operator has complete control of the current output at all times. Electrosection is capable of producing pure surgical cutting fully comparable to the best obtainable with cold steel. This type of instrument is better suited for dental use than the single unit type, but, since electrocoagulation, fulguration and occasionally even desiccation may be required for specific dental electrosurgical procedures, these also are not the instruments of choice for all-around usefulness.

MULTIPLE CIRCUIT UNITS—In order to make available all the useful electrosurgical currents in one instrument, electronic units have been built with dual circuits designed to deliver both fully rectified (Fig. 8) and partially rectified currents. With these instruments it is possible to perform electrosection and electrocoagulation by biterminal application of the respective currents, and desiccation or fulguration by monoterminal use of the partially rectified current. Desiccation and fulguration thus produced may not be quite as potent as that produced by spark-gap generators, but for use on thin oral mucosa are not only adequate, but in many respects more desirable. The dual circuit instruments are the most flexible and universally useful electronic instruments and are the ideal choice for the dental armamentarium.

The qualification "when properly used" has been repeatedly stressed and therefore should be explained. Electrosurgical effects produced by the various high-frequency currents are determined by the type of current (and waveform) employed. The extent and quality of the tissue responses, however, are determined by the manner in which the current is applied to the tissues. Therapeutically, therefore, electrosurgery is based on proper use of proper equipment. For that reason the qualification "when properly used," is vitally necessary.

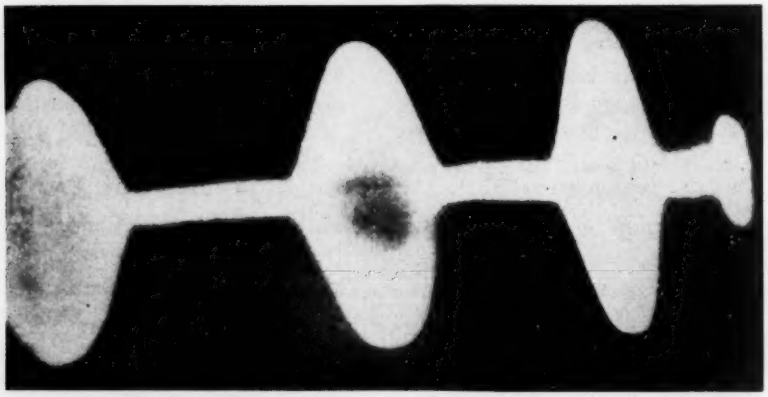

Fig. 6—Oscilloscope photograph of moderately damped waveform of partially rectified alternating current from single tube electronic unit

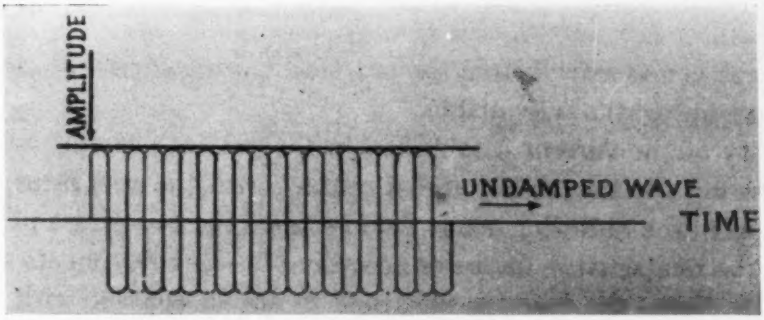

Fig. 7.—Diagram of undamped waveform of fully rectified alternating current

■ *Advantages Offered by Electrosurgery*

Pressure is never required to perform electrosurgery. Tissue, therefore, can be incised easily or resected even when it is loose and friable or on a shifting base. Normal tissue contours can be maintained when removing excess tissue by shaving in layers with loop electrodes. When hemostasis is important, "bloodless surgery" can be performed. Hemostatic effect accelerates and facilitates surgery by maintaining clear visibility in the operative field. Since the operator can shape electrodes to meet specific needs, areas that normally are difficult of access to cold steel become readily accessible to electrosurgical instrumentation. Shaping electrodes also facilitates accurate normal recontouring of the gingival architecture. Electrosurgical currents sterilize as they are applied; infected areas can be treated safely without fear of spreading infection. Gingival troughs can be prepared easily around abutment teeth, simplifying greatly the full mouth reversible and irreversible impression technics. In addition, since minute capillaries and lymph vessels are sealed off as the tissues are cut, since tissue can be resected without need for manipulation or pressure and therefore is free of the danger of being crushed or mutilated by the cutting instruments, electrosection is an ideal method for performing biopsy safely with minimal danger of surgical or mechanical metastasis.[6] Fulguration or electrocoagulation of the basal layer of tissue after the biopsy has been performed offers additional advantages for destroying invaginating tumor tissue *in situ*. Tissue repair is by soft scar formation, completely free of cicatricial contraction and identical in appearance to the surrounding tissues in color and texture. Excellent cosmetic results, therefore, are obtained. There are other advantages, far too numerous to mention.

■ *Summary and Conclusions*

The term "electrosurgery" has been much too loosely employed for describing therapeutic use of electric currents, thereby contributing to the existing general confusion and widespread misconceptions about it.

In order for an electrical device to

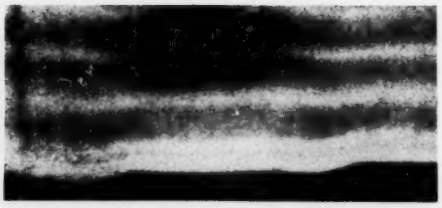

Fig. 8—Oscilloscope photograph of undamped waveform of fully rectified alternating current from multiple tube electronic unit

qualify as an electrosurgical instrument it should meet certain minimum specifications. It must operate on high-frequency alternating current. It must permit, to greater or lesser degree, operator control of the current output and extent of tissue alteration or destruction, Finally, it must permit precise accurately demarcated surgery and result in desirable tissue repair.

Electrocautery instruments fail to meet any of these specifications; therefore, they are not electrosurgical instruments and should never be confused with, or be used as such.

Unrectified alternating current has a damped waveform, partially rectified current a moderately damped waveform, and fully rectified current has an undamped waveform. Differences in tissue response to electrosurgical currents are attributed to the differences in waveform of these currents.

The basic electrosurgical tissue responses are (1) dehydration that coagulates the organic contents of tissue cells, a response produced by electrodesiccation, fulguration and electrocoagulation, and (2) disintegration and volatilization produced by electrosection, a true cutting current. When properly performed with fully rectified current, the latter is free of coagulation and is self-limiting in effect.

Desiccation and fulguration are produced by monoterminal use of highly damped or moderately damped high-frequency current. Electrocoagulation is produced by biterminal use of highly damped or moderately damped current. Electrosection is produced by biterminal use of fully rectified current. Partially rectified current used for electrosection is simultaneously accompanied by a degree of electrocoagulation.

Effective therapeutic use of electrosurgery is determined by proper use of proper electrosurgical equipment. To achieve this, thorough knowledge of the basic fundamental principles involved in electrosurgery is essential.

The ideal electrosurgical instrument for the dental armamentarium is one that is capable of producing all the electrosurgical tissue responses, with effective operator control. Multiple circuit electronic instruments, therefore, are the instruments of choice for the dental armamentarium.

Electrosurgery offers many invaluable advantages for dental procedures. Despite periodic reports of unfavorable sequelae to use of electrocautery or misuse of electrosurgery, which invariably can be attributed to shortcomings of individual operators, electrosurgery offers many noteworthy advantages for clinical operative, prosthetic, periodontic and oral surgery procedures.

When properly employed, electronic electrosurgery is safe, efficient, and has a wide range of usefulness in dentistry. Its greatest disadvantages are the neces-

sity of learning sound, precise electrosurgical technics, and the fact that facilities for teaching these technics are very limited.

The advantages electrosurgery offers dentistry are so numerous and so noteworthy that limitations in teaching facilities should not be permitted to deprive the profession of its benefits. This subject should be included in the undergraduate and postgraduate curricula of the profession to make training in basic principles and electrosurgical technics available to all, so that the profession may derive maximum benefit from it.—22 *West Eighty-second Street*

1. Ogus, W. I. Electrosurgery in dentistry. D. Digest. 48:411 Sept. 1942.
2. Saghirian, L. M. Electrosurgical gingivoplasty. Oral Surg., Oral Med. & Oral Path. 2:1549 Dec. 1949.
3. Strock, M. S. Rationale for electrosurgery. Oral Surg., Oral Med. & Oral Path. 5:1166 Nov. 1952.
4. Miller, I. F. Personal communication.
5. Brecker, S. C. Personal communication.
6. Oringer, M. J. Safeguarding biopsy by use of electronic electrosurgery. J. Oral Surg. 15:129 April 1957.
7. Thoma, K. H. Oral diagnosis with suggestions for treatment, ed. 2. Philadelphia, W. B. Saunders Co., 1946, p. 54.
8. Wyeth, G. A. Surgery of neoplastic diseases by electrothermic methods, ed. 1. New York, P. B. Hoeber, Inc., 1925.

■ Microbiological Terminology

All nomenclature codes agree that the scientific name of a species is made up of two parts. The first component is a proper noun, in the singular number, which designates the name of the genus in which the species is included; . . . the second component is to be termed a specific epithet. Although in bacteriology and botany the designations "species name" and "specific name" are synonymous, the specific epithet of the bacteriologist is the specific name of the zoologist. It should be clear that in bacteriology the specific epithet is not the name of a species, it is an explanatory word or phrase limiting the application of the generic name to a single species. A specific epithet may be a single word which in some way defines or limits or modifies the meaning of the generic name or it may be a single phrase consisting of two or more words which together convey a single idea, but which do not separately modify the generic name. The codes of nomenclature specify clearly that a specific epithet may be one of three types: (1) an adjective (simple or compound) which directly modifies the generic name, and agrees with a gender, number and case (*Sarcina lutea*, the yellow *Sarcina*); (2) a noun in the genitive modifying the generic name (*Escherichia coli*, the *Escherichia* of the colon), and (3) a noun in apposition with the generic name (*Xanthomonas prunicola*, the *Xanthomonas* of the plum dweller).—R. E. *Buchanan, Microbiological Literacy, Bacteriological Review, September 1958.*

Gustatory hyperhidrosis associated with subcondylar osteotomy

■ *Herman Kaplan,* D.D.S., East Syracuse, N. Y., and Paul N. Spring,† D.D.S., Buffalo*

In 14 instances of extraoral subcondylar osteotomy, seven patients experienced postoperative sweating and flushing of the skin over certain areas of the head and neck during mastication. This phenomenon is called gustatory hyperhidrosis and seems to be related to the misdirected regeneration of cut secretory and vasodilator fibers of branches of the auriculotemporal nerve. Since any surgical damage to the auriculotemporal nerve may produce this phenomenon, it behooves the operator to understand and recognize it as a relatively frequent complication.

Gustatory hyperhidrosis is a localized sweating and flushing of the skin over certain areas of the head and neck specifically associated with mastication. It is also known as Frey's syndrome, the auriculotemporal syndrome and, when its occurrence has deviated from the usual locale, the term "chorda tympani syndrome" has been suggested. In such an instance, sweating of small chin areas has been described after operative intervention on the submaxillary gland.[1]

Although physiologic sweating occurs in many persons on the forehead and lip during eating, its description as a pathologic entity is concerned with sweating and flushing of the skin in circumscribed areas which are related to the cutaneous distribution of specific nerves, mainly the auriculotemporal nerve. Although the term "hyperhidrosis" implies only sweating, vasodilation of the region accompanied by a reddening of the skin, a rise in skin temperature and a subjective feeling of warmth in these regions occurs frequently. Sweating may occur without flushing and vice versa, but most of the reported cases show both aspects of the syndrome. The purpose of this paper is to familiarize the reader with this entity and to describe its appearance after subcondylar osteotomy was employed to correct prognathism.

One of the more extensive studies on gustatory hyperhidrosis was made by Laage-Hellman in 1957. In a follow-up study of 450 patients after conservative parotidectomy, he was able to demonstrate some aspect of the syndrome in every

one.[2] His total incidence, compared to that of other investigators who had encountered the phenomenon, was explained by the author in terms of testing. Each case had been studied and tested in the clinic. In his explanation of the syndrome, Laage-Hellman completely followed the idea of Hogeman who, in 1951, made a follow-up survey of 170 cases of mandibular prognathism which had been surgically corrected. Of the 170 patients, 11 exhibited sweating (2 bilaterally, 9 unilaterally) and another 5 had flushing with subjective heat symptoms.[3] Hogeman was able to demonstrate graphically the area of sweating by using Minor's test in which the skin is painted with tincture of iodine and starch. The sweat causes solution of the ingredients, forming the characteristic blue-black color wherever sweat appears. This test is extremely sensitive even to pinpointing minute openings of sweat glands. In these cases and in Laage-Hellman's cases the area of sweating was seen to be the cutaneous distribution of the auriculotemporal nerve and its anastomoses with the facial nerve. Thus most of the sweating took place in the temporal and preauricular regions, with rare distribution to the cheek.

Hogeman's surgical approach had been a transverse osteotomy of the ascending ramus at a level 1 to 1.5 cm. below the mandibular notch. The incision was made at the posterior border of the ramus under the lobe of the ear, from which point a special saw was inserted. Hogeman postulated that since the auriculotemporal nerve ran around the posterior border in this region, there was always a chance of cutting it with this procedure. His anatomic explanation of the syndrome is thus intimately related to this nerve. The auriculotemporal nerve contains some secretory and vasodilator fibers to the parotid gland. When these are cut, there is misdirected regeneration of these fibers, which are parasympathetic, into the peripheral degenerated axons of other similarly injured sympathetic nerves to sweat glands and blood vessels in the skin. Thus a new reflex arc is established, so that on masticatory stimulation there is peripheral efferent discharge with localized sweating and vasodilation. It should be understood that there is, in addition, normal glandular secretion if a gland is present.

Hogeman's theory gains credence from the fact that procaine blocks of the auriculotemporal nerve block the onset of these symptoms. Further substantiation is provided by the time lag between operation and onset of symptoms, implying time for regeneration of nerve fibers. The anastomosis of the auriculotemporal nerve with the facial nerve accounts for distribution of symptoms to the cheek region. It was also found that the use of atropine blocked the appearance of the symptoms whereas the use of pilocarpine increased the sweating. Laage-Hellman agreed with Hogeman's explanation and considered that his own parotidectomy cases bore out the evidence for the hypothesis. Although many other theories have been advanced, Hogeman's appears to be the most acceptable.

We have encountered the syndrome after surgical correction of mandibular prognathism in which a technic of subcondylar osteotomy has been employed. The details of the entire operative technic will not be elaborated on here except to indicate the relationship to the syndrome.

■ *Surgical Procedure Associated with Syndrome*

A small incision is made in the skin at the posterior border of the ramus 30 mm. from the external auditory meatus in an inferior direction. An aneurysm needle, with a thin wire threaded through the opening, is manipulated so that it enters the tissues at the incision and emerges at a point approximately 30 mm. from the auditory meatus on a horizontal level (a point also previously marked). The aneurysm needle and wire traverse the tissues passing medial to the neck of the condyloid process. A Gigli saw is attached at the exit point, and the aneurysm needle is withdrawn carrying the saw back on the path just traversed and emerging at the original entrance point. This area is thus a focal point for a certain amount of surgical damage from the original stab incision and somewhat from the movements of the saw. In this regard it should be noted that the points of the saw at the ends have been modified so that tissue trauma is kept to a minimum. This small area at the skin coincides almost exactly with the incision area Hogeman used, which was on a level 1 to 1.5 cm. below the mandibular notch (sigmoid notch). This would account for our introduction to the syndrome, as the auriculotemporal nerve must be traumatized in a certain number of instances.

■ *Follow-up Study of Patients*

We studied all our mandibular prognathism cases in which subcondylar osteotomy was decided on as the treatment of choice. Although other types of procedures had been employed such as ostectomy in the body of the mandible, we could find no evidence that the syndrome occurred in these patients. The possibility was considered that questioning and searching for evidence of the syndrome might conceivably be the basis for neurotic focusing of attention to a region which probably had been forgotten in most of the patients. It was decided, therefore, not to use the Minor test for sweating as proposed by Hogeman but rather to use a simple questionnaire to get in touch with the patients. Those that answered in the affirmative to our specific question were asked to come in to be looked at.

There were 14 patients involved in the study. From these 14, negative replies were received from seven. One of the seven was questioned orally, as he was at the hospital for speech therapy. The question asked was:

> Have you noticed since your operation that the skin above or in front of your ears sweats, flushes or feels very warm when eating or chewing?
>
> Check proper box: Yes_____ No_____
>
> If answer is yes, please describe in detail below.

Another negative reply was recorded as number eight, but the patient's reply was received only nine weeks after the surgical procedure. It is felt that four months would be an arbitrary minimum time before symptoms could be expected in accordance with Hogeman's and Laage-Hellman's findings concerning regeneration.

Two patients did not reply, although follow-up letters were sent. The remaining four replies were positive. Of the four patients, three had sweating on one side only when eating, without flushing. The fourth had flushing without sweating also

on one side. All patients who had given positive replies were observed clinically except one who had written of a "warm feeling in front of the ear when eating." The possibility was considered that some of the patients who had made negative replies might prove to have the condition on testing, but as was stated before, further testing was felt to be unwarranted.

The situation was not extremely bothersome to these patients. One described his symptoms as follows: "When I finish eating, I wipe my mouth, then I wipe in front of my ear." That this unconcern is not always the case is shown in Laage-Hellman's study where 10 per cent of the 450 patients were extremely embarrassed when the symptoms appeared.[2] The symptoms may even become severe enough to cause the affected person to seek surgical relief. Two such cases are reported by Coldwater[4] in which he had to section the auriculotemporal nerve and the anastomosing facial branch with subsequent relief of symptoms. Other forms of treatment were tried, but the results were only temporary. Where radical parotidectomy is performed with concomitant removal of the auriculotemporal nerve and anastomosing branches, the syndrome is not encountered. Minor parotid operations, however, will lead to the production of symptoms.

■ *Summary and Conclusions*

The syndrome of gustatory hyperhidrosis has been described as a postoperative sequela to subcondylar osteotomy. This unusual condition may be encountered in any procedure where there is surgical damage to the auriculotemporal nerve. It may also be encountered in instances of damage to other nerves about the face and neck. Although it is not a common entity, the possibility of occurrence in certain surgical procedures, including condylectomy and related condylar manipulations, should be understood and recognized. It behooves the operator to consider the type of incision contemplated and to modify it accordingly where feasible. If this is not practical, the patient may be informed about the possibility of encountering these bizarre symptoms.—22 *Caton Drive.*

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1. Young, A. G. Unilateral sweating of the submental region after eating (chorda tympani syndrome). Brit. M. J. 2:976 Oct. 27, 1956.

2. Laage-Hellman, J. E. Gustatory sweating and flushing after conservative parotidectomy. Acta otolaryngol. 48:234 Sept. 1957.

3. Hogeman, K. E. Surgical-orthopedic correction of mandibular protrusion. Acta chirurg. scandinav. (supp. 159) p. 100, 1951.

4. Coldwater, K. B. Surgical treatment of the auriculotemporal syndrome. A.M.A. Arch. Surg. 69:54 July 1954.

■ Accuracy

Accuracy is the twin brother of honesty; inaccuracy is a near kin to falsehood.—*Tyron Edwards.*

Blood sugar levels during the dental experience
I. Blood sugar level in the waiting room

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A number of factors operate, in a check and balance fashion, to regulate the blood sugar concentration in any one moment. Whether epinephrine as introduced to a diabetic patient via a local anesthetic assumes the role of an adverse regulating factor is still subject to considerable debate. This report, the first of four, describes a clinical experiment designed to analyze the blood sugar level of diabetics and nondiabetics in the stressful waiting room situation, and thereby shed more light on the best procedure to handle diabetics.

There is still considerable debate as to whether epinephrine should or should not be used with local anesthetic solutions in diabetic patients. Authors in recent dental literature (1938-1958) are about equally divided into two camps: (1) those who advocate the use of epinephrine or, at least, claim no deleterious effects,[1-9] and (2) those who contend that epinephrine is definitely contraindicated.[10-16]

The confusion is due to the fact that no one has studied, under carefully controlled conditions, the changes in blood sugar which occur during oral therapy. This series of reports will analyze the blood sugar variations which take place during the dental experience.

Evidence has already been presented[17] that the dental experience is stressful as shown by a significantly elevated blood pressure in both normotensive and hypertensive subjects while seated in the waiting room anticipating the extraction of a tooth. Specifically, it was shown that the systolic, diastolic, mean, and pulse pressures were significantly elevated when compared with measurements taken under basal conditions (when the patient was not anticipating dental extraction).

Additional evidence to underscore the stressful nature of the dental experience has been shown by a study of eosinophilic counts before and after the extraction of a tooth, the cutting of a cavity preparation, impression taking, and while eliciting a history from a patient.[18]

This report will attempt to answer the following questions with regard to stress in the dental waiting room:

1. Is sitting in the waiting room a stressful situation for the nondiabetic patient as measured by the blood sugar level?

2. Is sitting in the waiting room a stressful situation for the diabetic patient as measured by the blood sugar level?

A second report[19] will analyze the effect of sedation on the blood sugar concentration while the patient is in the waiting room. A third report[20] will consider the effect of epinephrine in local anesthetic solutions on blood sugar concentration. A fourth and last report[21] will present the evidence for fluctuations in the blood sugar level during the extraction of a tooth.

■ *Review of the Literature*

In order to understand the blood sugar changes which could conceivably occur during the dental experience, it is important to review briefly the factors, organs and systems which influence the blood sugar. They include: (1) the dietary intake of carbohydrate, (2) the intestinal absorption of glucose, (3) the liver, (4) the kidneys, (5) hormonal influences, and (6) the autonomic nervous system.

DIETARY INTAKE OF CARBOHYDRATE—Carbohydrates constitute 50 to 60 per cent of the total caloric intake of the diet of the average person in the United States.[22] Thus, a considerable quantity of sugar is introduced into the human system which exerts a significant but transient effect on the blood sugar. As a matter of fact, this phenomenon lies at the basis of the glucose tolerance test.[23] Almost immediately after the ingestion by a normal adult in the postabsorptive state of 50 to 100 Gm. of glucose, the sugar concentration rises in both the arterial and venous blood. The arterial blood glucose reaches a peak of 150 to 200 mg. per hundred cubic centimeters in approximately 30 minutes. The venous blood glucose attains a maximum at 30 minutes of about 50 mg. per hundred cubic centimeters less than in the arterial tree. In one and one-half to three hours, the blood sugar concentration in the blood has returned to normal and may even be slightly subnormal.

The role of dietary intake of carbohydrate in relation to blood sugar concentration has direct bearing on this study since carbohydrate intake affects blood sugar for one to three hours after ingestion. In order to reduce and possibly eliminate the effect of dietary carbohydrate, all subjects were studied in the postabsorptive state.

INTESTINAL ABSORPTION OF CARBOHYDRATE—Under normal conditions, the end-products of carbohydrate digestion are absorbed in the small intestine. A healthy individual is capable of absorbing 1 Gm. of carbohydrate per kilogram of body weight per hour. This means then that the average 150 pound (70 kilogram) man can absorb practically all the available carbohydrate end-products from the small intestine within the first hour after a meal. Intestinal absorption may be modified by a number of factors such as nutritional deficiency states, and thyroid and adrenocortical imbalance.

LIVER—The liver plays a significant role in the regulation of the blood sugar

because: (1) it stores glucose as glycogen to be converted back to glucose as needed by the body, and (2) it forms glycogen from noncarbohydrate sources. Glycogenesis and glycogenolysis are affected by the hormones of the endocrine glands. For example, epinephrine accelerates glycogenolysis,[24] insulin speeds glycogenesis, and gluconeogenesis is under the influence of the adrenocortical steroids.

KIDNEYS—It should be recalled that all the circulating plasma glucose is filtered through the renal glomeruli and then completely reabsorbed in the tubules of the kidney. The end result is the absence of glycosuria under physiologic conditions. The tubular reabsorption of glucose is under hormonal control. Thus, reabsorption is increased in hyperthyroidism. Certain adrenocortical hormones decrease reabsorption. Finally, recent work demonstrates that gluconeogenesis can occur in the kidney.[25]

HORMONAL INFLUENCES—A study of the literature on hormonal influences[26,27] reveals that all the hormones which exert an effect on the blood sugar do so by way of enzymes which act, in one way or another, on the formation, utilization, storage or destruction of glucose. The endocrine glands which participate in these mechanisms are: (1) pancreas, (2) anterior hypophysis, (3) adrenal cortex, (4) adrenal medulla and (5) thyroid.

1. The islets of Langerhans produce a hormone, insulin, which is capable of reducing the blood sugar. This is accomplished by way of six different mechanisms: (1) encouraging the formation of fatty acids from glucose, (2) promoting the peripheral oxidation of glucose, (3) by releasing hexokinase from under the inhibitory influence of a hormone of the anterior lobe of the hypophysis,[28] (4) increasing the rate of formation of liver and muscle glycogen, (5) slowing glycogenesis from protein, and (6) participating in the synthesis of tissue protein from amino acids. All these mechanisms have one feature in common—the reduction in the blood sugar concentration.

2. Two hypophysial hormones exert a diabetogenic effect by elevating the blood sugar. They are: (a) growth hormone, and (b) adrenocorticotrophic hormone.

a. In the light of present knowledge, it is generally held that elevation of blood sugar due to the growth hormone is the result of inhibition of the peripheral oxidation of glucose.

b. The hyperglycemic action of ACTH is due to its stimulatory effect on the adrenal cortex which will be considered next.

3. The evidence is clear-cut that the adrenocortical hormones which alter carbohydrate metabolism are the 11-oxygenated steroids (cortisone and hydrocortisone). These hormones raise the blood sugar through two different mechanisms:[29] (1) by increasing the rate of gluconeogenesis from protein, and (2) like the growth hormone, by depressing the rate of tissue utilization of glucose.

4. Epinephrine elevates blood sugar by freeing liver glycogen (glycogenolysis). Also, it is now clear that epinephrine stimulates the release of ACTH by the anterior lobe of the hypophysis.[30]

5. The minor role of the thyroid gland in blood sugar regulation is due to the effect of the thyroid hormone on intestinal absorption of glucose.[31] Thus it is that hyperthyroidism is associated with increased absorption and hypothyroidism with decreased uptake of carbohydrate end-products from the small intestine.

AUTONOMIC NERVOUS SYSTEM—The autonomic nervous system consists of two divisions: (1) the thoracolumbar or sympathetic system, and (2) the craniosacral or parasympathetic system. Both of these systems exert a significant effect on the blood sugar concentration.[32]

1. There is abundant evidence that stimulation of sympathetic centers and fibers causes a rise in blood sugar.[33,34] From a teleologic standpoint, this has been deemed as a beneficial mechanism since, in emergency situations, more energy is required. Naturally, the release of epinephrine and the consequent hyperglycemia brings more energy-bound glucose to the tissues.

2. It has also been shown that parasympathetic excitation (vagus) lowers the blood sugar.[35] This end-result also has teleologic significance since: (1) the reduction in blood sugar is due to the release of greater amounts of insulin, and (2) insulin accelerates the utilization of glucose by the tissues. Fortunately, in an emergency situation, glucose is required to be brought to the tissues in greater amounts and that which is delivered to the tissues must be utilized more efficiently. Apparently, excitation of both the sympathetic and parasympathetic systems in situations of stress serve admirably to counter the situation.

SIGNIFICANCE—It is clear from this brief discussion that a number of factors operate, in a check and balance fashion, to regulate the blood sugar concentration in any one moment. However, the mechanisms which are particularly pertinent to this report are those which result from changes in the autonomic nervous system. These will be analyzed in greater detail because: (1) it is generally recognized that the dental experience evokes a stress reaction, and (2) emotional stress exerts its systemic effects via the autonomic nervous system.

The available reports[36-38] of studies with animals indicate that there is first an increase and then a decrease in blood sugar concentration when animals are subjected to stress situations.

A number of very significant reports are available which consider the changes in blood sugar concentration under stress conditions in both normal human beings and those suffering with diabetes mellitus.

In nondiabetic subjects, the evidence indicates that there is either no increase in blood sugar when a normal subject is placed under stress or the usual response to stressful situations yields a 5 to 20 mg. per hundred cubic centimeter decrease in blood glucose with the greatest decrements in those individuals with the highest blood sugar concentrations.[39] Other investigators have shown a hypoglycemia under stress circumstances.[40-42] However, there is some proof that, in more prolonged and severe stress, hyperglycemia (as high as 180 mg. per hundred cubic centimeters) can be observed.[43,44]

In most diabetic subjects, under the usual emotional excitement commonly encountered, there is a rapid fall in blood

Table 1 • Number of experiences

Number of times each patient participated in the study	Nondiabetic subjects	Diabetic subjects	
		Diabetes uncontrolled	Diabetes controlled
1	54	8	7
2	6	1	3
3	2	1	0
4	1	0	0
5	1	1	0

sugar concentration. A few show a slight hyperglycemia. On the other hand, it has been claimed that hyperglycemia can be produced experimentally in diabetic patients during psychiatric interviews.[45]

A rather interesting study[46] has shown that, when the blood of psychotic patients with normal or elevated blood sugar concentrations was injected into hypophysectomized-adrenomedullated rats, hypoglycemia resulted. In contrast, the injection of blood from normal subjects who were under conditions of stress into the same rats produced either normoglycemia or only slight hyperglycemia. These experiments indicate that the parasympathetic system predominates in psychotic patients and the sympathetic system is more active in the normal person under stress conditions.

It appears[47] that the autonomic response to emotional stress (the dominance is either sympathetic or parasympathetic) is determined by the form and intensity of the emotional excitement and the nature and background of the individual who is under stress.

■ *Method of Investigation*

The entire study, to be described in four parts, was made on 85 patients in the department of oral surgery of the University of Alabama School of Dentistry. The study included 68 Negroes and 17 white persons; there were 76 females and 9 males. The patients ranged in age from 16 to 80 in the nondiabetic group and 18 to 80 in the diabetic category. Table 1 outlines the number of nondiabetic subjects, the number of patients with diabetes either controlled or uncontrolled, and the number of times each of the subjects participated in the experiment. Since some of the patients were studied more than once, the 85 individuals provided 112 dental experiences.

The data were recorded on a standard form (see illustration). The name, age, sex and race of the patient were recorded in addition to the nature of the operation, type and amount of local anesthetic solution, and the presence or absence of a vasoconstrictor agent. Each patient was questioned carefully in connection with his medical background and particularly regarding the possibility of diabetes mellitus.

The procedure established in this study was designed to reproduce, as nearly as possible, the situation which prevails in the average dental office. This is the procedure previously described in connection with a study of the effect of a dental experience on blood pressure and pulse rate.[17,48-50]

In this first portion of the study, attention was focused on the blood sugar of the patient while seated in the waiting room anticipating the extraction of a tooth. The procedure outlined here and indicated by the illustration was carried out on each of the subjects. Immediately after the patient arrived in the waiting

room he was seated in a chair, the finger was pricked and capillary blood drawn. All of the microestimations of blood sugar were made with Folin filtrate.[51]

In order to ascertain how these blood sugar concentrations compared with the blood sugar level under normal conditions, each patient was instructed to return at another date so that a glucose tolerance test could be done to: (1) determine whether the patient was or was not diabetic, and (2) to obtain a blood sugar concentration under so-called basal conditions. Actually, basal determinations were made on 46 of the nondiabetic and 8 of the diabetic patients. The one hour Exton-Rose glucose tolerance test was used as a screening procedure.[52] If the findings were questionable, the classical three hour method was used.[53] The findings in these 54 patients constitute the subject of this report.

Group____ Name_____ Age____ Sex____ Race____

Chart number_____ Date_____ Phone_____

Anesthetic agent_____ Amount of anesthetic solution____

Amount of epinephrine_____ Type of surgery_____

History of diabetes mellitus_____

Sedation_____ Last meal_____ Temperature_____

Time	Stage in the dental experience	Sugar level
_____	Initial (waiting room)	_____
_____	1 minute preinjection	_____
_____	1 minute postinjection	_____
_____	3 minutes postinjection	_____
_____	5 minutes postinjection	_____
_____	10 minutes postinjection	_____
_____	Start of dental extraction	_____
_____	Middle of dental extraction	_____
_____	End of dental extraction	_____
_____	Fasting blood sugar	_____

Glucose tolerance test_____

Remarks

Examination form on which data were recorded

■ *Results*

The findings will be considered in three categories: (1) the blood sugar concentration of the patient while seated in the waiting room anticipating the extraction of the tooth, (2) the blood sugar level under so-called basal conditions when the patient had been assured there would be no dental extraction, and (3) the effect on the blood sugar level in the waiting room of repeated visits to the dental office.

BLOOD SUGAR LEVEL OF PATIENTS SEATED IN THE WAITING ROOM—On the basis of the history, the clinical record and the glucose tolerance test, the 54 subjects were divided into two groups: (1) nondiabetic and (2) diabetic.

1. The blood sugar concentrations of 46 nondiabetic persons seated in the waiting room showed a considerable spread. There was a range from a high of 130 mg. per hundred cubic centimeters to a low of 68 mg. The mean blood sugar concentration for the nondiabetic group in the waiting room was found to be 105.2 mg.

2. The blood sugar concentrations of eight diabetic subjects in the waiting room showed a slightly greater spread than was observed in the nondiabetic group. The range extended from a high of 170 mg. per hundred cubic centimeters to a low of 92. The mean blood sugar concentration for the diabetic group in the waiting room was found to be 125.5 mg.

BLOOD SUGAR LEVEL UNDER BASAL CONDITIONS—It is, of course, impossible

Table 2 • Initial (waiting room) blood sugar determinations in ten nondiabetic and five diabetic patients at repeated visits

Patient	Visit number				
	1	2	3	4	5
Nondiabetic					
A	114	92	112		
B	126*	100	—		
C	124*	130*	112*	106	—
D	116	114	—	—	—
E	116	130	102*	96*	88
F	112*	116	—	—	—
G	130*	96	—	—	—
H	114	102	—	—	—
I	116*	120	—	—	—
J	92	110*	140		
Diabetic					
K	282	250			
L	186	170	146	130	124
M	100	110*	130		
N	102*	104			
O	114*	120			

*The experience was relatively traumatic as evidenced by a need for additional anesthesia.

to obtain a true blood sugar level under basal conditions since the thought of returning to the dental office might in itself be stressful enough to alter the blood picture. However, the patients were told to return and were assured that there would be no dental manipulation. The basal blood sugar concentrations are considered in regard to two categories of patients: (1) nondiabetic and (2) diabetic.

1. The range of blood sugar concentrations in nondiabetic patients was from a high of 126 mg. per hundred cubic centimeters to a low of 72 mg. The mean for the group was found to be 102.8 mg.

2. The range of blood sugar concentrations in diabetic patients was from a high of 144 mg. per hundred cubic centimeters to a low of 100 mg. The mean blood sugar concentration was found to be 120.9 mg.

EFFECT OF REPEATED VISITS ON BLOOD SUGAR LEVEL IN THE WAITING ROOM—As shown in Table 1, the opportunity presented itself to study the effects of repeated visits to the dental office in 16 patients. Table 2 shows the blood sugar concentrations of patients in the waiting room at each of these visits. If a person suffered considerable difficulty during the experience, this is noted by an asterisk.

■ *Discussion*

The findings will be considered in three categories: (1) the blood sugar levels as observed initially when the patient first arrived in the waiting room, (2) the blood sugar concentrations obtained under basal or at least quasi-basal conditions, and (3) the initial waiting room blood sugar levels in persons who were subjected to repeated dental visits.

An examination of the two groups

Table 3 • Comparison of blood sugar levels in the waiting room and under basal conditions

Type of patient	Number of patients	Degrees of freedom	Mean blood sugar in the waiting room in mg. %	Mean blood sugar under basal conditions in mg. %	Difference		Standard error of difference of means	Observed t value	P
					Range	Mean			
Nondiabetic	46	90	105.2	102.8	−48 to +18	−2.4	± 7.1	.33802	>.05
Diabetic	8	14	125.5	120.9	−40 to +18	−4.6	±11.3	.40707	>.05

of subjects, namely those with and without diabetes mellitus, reveals that the blood sugar concentration was higher in the waiting room than it was under basal circumstances. Specifically, Table 3 indicates differences of 2.4 and 4.6 mg. per hundred cubic centimeters in the nondiabetic and diabetic groups respectively. It is of particular interest that both of these values are statistically insignificant as evidenced by a probability greater than .05.

Also of interest is the fact that there appear to be significant alterations in the initial, waiting room, blood sugar concentrations in the diabetic subjects. An examination of Table 4 discloses that about one half of the nondiabetic subjects who suffered a difficult experience had, at the next visit, a blood sugar concentration which was higher, whereas the other half showed blood sugar levels which were lower. In contrast, every diabetic subject who had an easy experience at one visit showed a lower blood sugar concentration in the waiting room the next time he appeared for extraction. This observation seems to be supported by the fact that those diabetic persons who suffered a difficult time at one visit had a higher blood sugar concentration at the next visit. Unfortunately, the number of cases is small and the data do not allow for statistical evaluation and clear-cut conclusions.

Table 4 • Relationship of blood sugar level with previous experience of patient in the dental office

Experience in the dental office	Nondiabetic patients				Diabetic patients			
	Blood sugar level higher at next visit		Blood sugar level lower at next visit		Blood sugar higher at next visit		Blood sugar lower at next visit	
	No.	%	No.	%	No.	%	No.	%
Difficult	4	57	6	60	3	75	0	0
Easy	3	43	4	40	1	25	5	100

■ *Summary*

There is still considerable debate as to whether epinephrine should or should not be used with local anesthetic solutions in diabetic patients.

The blood sugar concentration while the patient is seated in the waiting room of a dental office anticipating the extraction of a tooth is described in this report. The evidence suggests, within the limits of the experiment, that the blood sugar concentration is not appreciably elevated under these conditions.

The data suggest that the blood sugar concentration of diabetic patients in the waiting room at subsequent visits is modified by the previous experience. In other words, the diabetic patient who suffers a stressful visit to the dentist will very likely at the next visit show a high blood sugar concentration. Conversely, the diabetic subject who is minimally traumatized at one visit will display a lower blood sugar concentration at the next visit.

A report to follow[19] will analyze the effect of sedation on the blood sugar of the nondiabetic and diabetic patient while seated in the waiting room anticipating the extraction of a tooth.

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1. Blaustein, Samuel. Dental surgery in diabetes mellitus. D. Items Interest 61:951 Oct. 1939.

2. Blaustein, Samuel. Case reports. D. Items Interest 62:113 Dec. 1940.

3. Dillon, Charles. Choice of anaesthetic for dental operations on diabetic patients. D. Gaz. 9:506 Aug. 1943.

4. Amies, G. C., and Park, S. F. Dental survey in diabetic children. Austral. J. Den. 52:233 July 1948.

5. Schmidt, E. J. Dental aspects of diabetes mellitus. Penn D. J. 54:33 Jan. 1951.

6. Knapp, R. G., Jr.; Nathanson, I. G., and Mallett, S. P. Acute dental infection in diabetes. Oral Surg., Oral Med. & Oral Path. 4:1369 Nov. 1951.

7. Cohen, A. S. Management of diabetes mellitus during oral surgical procedures. J. Oral Surg. 14:29 Jan. 1956.

8. Moss, A. A. Dental survey for the diabetic patient. New York Univ. J. Den. 14:165 June 1956.

9. Mandiwall, H. Dental surgery and the diabetic patient. D. Practitioner & D. Record 7:255 May 1957.

10. Rudy, A., and Cohen, M. M. Oral aspects of diabetes mellitus. New England J. Med. 219:503 Oct. 6, 1938.

11. Barach, J. H. Diabetes and its treatment. New York, Oxford University Press, 1949, p. 91.

12. Ginsberg, G. Pre-operative and post-operative management of diabetics. (Abst.) J. New Jersey D. Soc. 21:5 July 1950.

13. Diabetes mellitus. Bul. Cleveland D. Soc. 6:19 Dec. 1950.

14. Sindoni, A., Jr. Role of the dentist in diabetes mellitus. J. D. Med. 9:203 Oct. 1954.

15. Martinez, E. Diabetes in dental practice. D. Abst. 1:178 March 1956.

16. Wasserman, B. S. Oral aspects of diabetes mellitus. D. Students' Mag. 35:29 May 1957.

17. Cheraskin, E., and Prasertsuntarasai, T. Use of epinephrine with local anesthesia in hypertensive patients. I. Blood pressure and pulse rate observations in the waiting room. J.A.D.A. 55:761 Dec. 1957.

18. Ship, A. G. Physiologic response to stress in dental patients. Oral Surg., Oral Med. & Oral Path. 10:377 April 1957.

19. Cheraskin, E.; Flynn, F. H., and Fess, L. Blood sugar levels during the dental experience. II. Effect of sedation upon the blood sugar in the waiting room. Unpublished.

20. Cheraskin, E.; Flynn, F. H., and Fess, L. Blood sugar levels during the dental experience. III. Effect of epinephrine with local anesthetic solutions upon the blood sugar. Unpublished.

21. Cheraskin, E.; Flynn, F. H., and Fess, L. Blood sugar levels during the dental experience. IV. Effect of tooth extraction upon the blood sugar. Unpublished.

22. Williams, R. H., editor. Textbook of endocrinology, ed. 2. Philadelphia, W. B. Saunders Co., 1955, p. 411.

23. Grollman, Arthur. Clinical physiology. New York, Blakiston Division, McGraw-Hill Book Co., 1957, p. 53.

24. Sutherland, E. W. Effect of hyperglycemic factor of the pancreas and of epinephrine on glycogenolysis. Rec. Prog. Hormone Res. 5:441, 1950.

25. Drury, D. R.; Wick, A. N., and MacKay, E. M. Formation of glucose by the kidney. Am. J. Physiol. 163:655 Dec. 1950.

26. Conn, J. W. Endocrine regulation of the blood sugar. Ann. Int. Med. 38:179 Feb. 1953.

27. Long, C. N. H. Endocrine control of the blood sugar. Diabetes 1:3 Jan.-Feb. 1952.

28. Colowick, S. P.; Cori, G. T., and Slein, M. W. Effect of adrenal cortex and anterior pituitary extracts and insulin on hexokinase reaction. J. Biol. Chem. 168:583 May 1947.

29. Conn, J. W.; Louis, L. H., and Johnston, Margaret. Studies upon mechanisms involved in the induction with adrenocorticotropic hormone of temporary diabetes mellitus in man. Proc. Am. Diabetes A. 8:213, 1948.

30. Gershberg, H., and others. Role of epinephrine in secretion of adrenal cortex. Yale J. Biol. & Med. 23:32 Sept. 1950.

31. Althausen, T. L., and Stockholm, M. Influence of thyroid gland on absorption in digestive tract. Am. J. Physiol. 123:577 Sept. 1938.

32. Gellhorn, E. Blood sugar and autonomic nervous system. Acta Neuroveg. 9:74, 1954.

33. Cannon, W. B. Bodily changes in pain, hunger, fear and rage, ed. 2. New York, D. Appleton & Co., 1929.

34. Cannon, W. B. Organization for physiological homeostasis. Physiol. Rev. 9:399 July 1929.

35. Britton, S. W. Studies on conditions of activity in endocrine glands; nervous control of insulin secretion. Am. J. Physiol. 74:291 Oct. 1925.

36. Selye, H. General adaptation syndrome and diseases of adaptation. J. Clin. Endocrinol. 6:117 Feb. 1946.

37. Ingle, D. G., and Nezamis, J. E. Effect of stress upon glycosuria of force-fed depancreatized and of adrenalectomized-depancreatized rats. Am. J. Physiol. 162:1 July 1950.

38. Van Middlesworth, L.; Kline, R. F., and Britton, S. W. Carbohydrate regulation under severe anoxic conditions. Am. J. Physiol. 140:474 Jan. 1944.

39. Hinkle, L. E., Jr., and Wolf, S. Effects of stressful life situations on concentration of blood glucose in diabetic and nondiabetic humans. Diabetes 1:383 Sept.-Oct. 1952.

40. Portis, S. A. Life situations, emotions, and hyperinsulinism. J.A.M.A. 142:1281 April 22, 1950.

41. Association for research in nervous and mental disease. Life stress and bodily disease. Baltimore, Williams & Wilkins Co., 1950, p. 406-411.

42. Rennie, T. A. C., and Howard J. E. Hypoglycemia and tension-depression. Psychosom. Med. 4:273 July 1942.

43. Bowman, K. M., and Kasanin, J. Sugar content of blood in emotional states. Arch. Neurol. & Psychiat. 21:342 Feb. 1929.

44. Edwards, H. T.; Richards, T. K., and Dill, D. B. Blood sugar, urine sugar and urine protein in exercise. Am. J. Physiol. 98:352 Sept. 1931.

45. Mirsky, I. A. Emotional hyperglycemia. Proc. Central Soc. Clin. Res. 19:74, 1946.

46. Gellhorn, E.; Feldman, J., and Allen, A. Effect of emotional excitement on insulin content of blood. Arch. Neurol. & Psychiat. 47:234 Feb. 1942.

47. Wolff, H. G. Life stress and cardiovascular disorders. Circulation 1:187 Feb. 1950.

48. Cheraskin, E., and Prasertsuntarasai, T. Use of epinephrine with local anesthesia in hypertensive patients. II. Effect of sedation on blood pressure and pulse rate. J.A.D.A. 56:210 Feb. 1958.

49. Cheraskin, E., and Prasertsuntarasai, T. Use of epinephrine with local anesthesia in hypertensive patients. III. Effect of epinephrine on blood pressure and pulse rate. J.A.D.A. 57:507 Oct. 1958.

50. Cheraskin, E., and Prasertsuntarasai, T. Use of epinephrine with local anesthesia in hypertensive patients. IV. Effect of tooth extraction on blood pressure and pulse rate. J.A.D.A. 58:61 Jan. 1959.

51. Bio-photocol handbook. New York, Hellige, Inc.

52. Exton, W. G., and Rose, A. R. One-hour two-dose dextrose tolerance test. Am. J. Clin. Path. 4:381 Sept. 1934.

53. Isaacson, V. I. Blood sugar. J.A.M.A. 70:1131 April 20, 1918.

Dentistry in the hospital—an integral part of total health service

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Although hospital dental service has made great progress in the last decade, many problems remain. The solution of these problems will be solved by education, not only of dentists, but of other members of the hospital team. The modern hospital is the central health agency of the community. It is here that dentists and physicians join to render the best health care to the patients. This article illustrates how this can best be accomplished.

In its long and sometimes hectic history, the hospital has undergone remarkable changes, ranging from the medieval notion that it was a prison for persons possessed of the "devils" of disease, to the modern idea of a medical center with all the resources of science at its command. Once a place in which the old and "incurably ill" were relegated to an undignified obscurity and death, today the hospital is a place of teaching, of learning, and of research, accepted by the public as the basic health agency of the community. Even now, it goes beyond the immediate care of the sick to become the center of an integrated, community-wide program for the prevention of illness and for the rehabilitation of the disabled.

It is unfortunately true that because of the harassment and frustration that are occupational hazards in the management of hospitals today, the administrator has a tendency to forget not only that patients are people, but also that administration is fundamentally an enabling process, the oil that enables the hospital's intricate machinery to run as smoothly and as free from friction as possible. Although its importance must not be underestimated—for without administration there can be nothing but chaos in any large social group—administration is nevertheless not an end in itself. It is only a means to the end that, through proper coordination and correlation of all departments, both professional and nonprofessional, the hospital may give to its patients and thus necessarily to its medical staff a consistently high quality of service.

The hospital house has many mansions, and there is room in it for the worker, the student and the teacher. Like a small town, every institution has its own

cultural pattern, its own behavior characteristics, its own values, standards and traditions, just as every individual has his. Always providing that the standards are socially and professionally acceptable and flexible, rather than rigid and undesirable, an administrator should recognize and understand the values of the hospital he represents, and he must work with the medical staff and governing body to maintain those standards and raise them wherever it is deemed necessary.

These things, of course, are not easy to accomplish, nor can they invariably be done speedily. Requests must be measured against the needs of the institution, and there are always budgetary restrictions to consider; but in many ways, the administration is able to help the staff not only on a group basis, but also on an individual level.

In these developments, dentistry has an important part to play, although its assumption of its real role has been postponed too long. Dr. Leroy E. Burney[1] said:

> Dental progress in research, education and clinical practice can be advanced if the alliance between dentistry and medicine is strengthened. The development of close ties between Medicine and Dentistry benefits the population as a whole.

Unfortunately, dentistry has lagged behind hospital administration and organized medicine in developing prepayment or insurance plans that would permit a broadening of dental procedures for which any patient might be hospitalized. However, prepaid hospitalization programs must inevitably increase their coverage with the inclusion of dental services, with a resulting increase in the number of dentists seeking hospital privileges. There may also be increased need for hospital dental facilities and trained personnel to accompany the growing demands for dental care for physically or mentally handicapped or emotionally disturbed persons.

Henny[2] has written at length of dentistry's role in interdepartmental hospital relations. Some of his thoughts are repeated here:

> Dental education, although based on the same broad scientific background as medicine, specializes in detail not only in treatment but also in the anatomy, physiology and pathology of the oral cavity and masticating system. As a result, both undergraduate and graduate education in dentistry has been developed in such a fashion as to gain a greater understanding of the problems arising in this field both as local entities and also as they involve alterations in physical health.
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> Consequently, the chief contributions to the accumulation of knowledge regarding the various diseases, deformities, infections and management of trauma of the oral cavity and its associated structures have been made by investigators and clinicians with dental backgrounds, whereas medicine has expended very little educational effort in this area (of the oral tissues and structures) since it has generally accepted the premise that this was the chief responsibility of the profession of dentistry.
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> To meet these responsibilities and to produce an ever higher level of quality of patient care, dentistry long ago established special fields of interest and study which today are the recognized dental specialties. . . .
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> Ideally, the modern American hospital dental department has all of these specialties represented by staff personnel who have received formal graduate training in their chosen field. In many instances a given patient may require the cooperative effort of a majority of the dental staff to attain the finest possible end result, in addition to the cooperation of the medical department. . . .

> . . . it is to the patient's advantage to have the best possible cooperation between the dental staff and all divisions of the hospital organization. In order to develop such relations, however, it is important for the staff members of the various hospital departments to understand the educational background and clinical contributions of the dental staff. There can be no room for a superior or monopolistic attitude on the part of either the medical or dental staff.

In the total program of the hospital the dental department commonly makes little use of the clinical laboratories. Although the hospital records of both inpatients and outpatients have the pertinent routine physical and laboratory data, dentists do not with any consistency submit material for bacteriological studies of organisms in endodontics, or for antibiotic sensitivity studies, or for routine microscopic study of tissues removed during surgery.

At the risk of increasing the number of complaints from the clinical pathological laboratory that it is overworked and understaffed, it must be stressed that the laboratory should be used constantly, since it brings dental treatment into a closer relationship with the diagnostic facilities and the basic scientific activities of the hospital. Its use provides the bridge with associates in medicine for adequate preoperative surveys and postoperative consultations when they are required.

One of the problems that often besets the hospital administration as well as the chief of dentistry is the question of the dentist's boundaries of activities and responsibilities in the hospital. It can be readily agreed that dentistry should enjoy the same recognition in the constitutional organization of the hospital as any other health specialty, and that it should have an equal measure of autonomy in the selection of its staff and in the conduct of intradepartmental activities. However, Cadmus[3] discusses the problem that arises

> . . . when a dentist says that since he is legally able to practice without supervision outside of the hospital, what authority does the hospital have to limit him on the inside. Historically, trustees have delegated professional care to the medical staff. If, under the circumstances, the physicians recommend a policy such as no surgery without a physical examination by a physician, then the Board of Trustees accept this suggestion of their advisers and within their legal authority, adopt this as an internal regulation. Trustees usually feel that they must accept the physician's advice in such matters, and they feel legally comfortable with the professional backing of the medical staff. I believe that trustees feel no compulsion to open their doors to other health workers including dentists, unless so advised by the medical staff. . . .
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> . . . the administrator should recognize hospital dentistry as something more than oral surgery. He should see that there are dental instruments, personnel equipped to assist, and in general, the facilities should be made equally available to physician and dentist according to the ability of the institution. . . .
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> . . . the best medical care is provided when a physician performs the presurgical physical examination. . . . the public will demand this, particularly in the hospital setting. This is not discrimination against dentists because, often, there are restrictions placed on general practitioners or on other specialties in much the same manner. . . .
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> . . . definitions and boundaries are best settled locally rather than at a national level, and on the basis of mutual professional trust and respect. . . . if an individual dentist is qualified and able to provide good dental care, his work will be recognized and his demands will be met and understood. Dentistry is making great strides in education and this will automatically help solve much of the problem.

It need scarcely be added that any proposals relating to the practice of dentistry in the hospital must conform to the requirements of the Joint Commission on Accreditation of Hospitals.

A glance at modern surgical technics, such as open heart surgery, or the development of the stereotaxic procedures in neurosurgery, gives convincing indication that there is a trend toward the growth of teamwork in the operating room, especially in major or complicated surgery. Instead of the surgeon working with an assistant, an anesthesiologist and one or two nurses, the operating room today may be crowded with two or three surgeons, an anesthetist, two or three nurses and as many as half-a-dozen other physicians and technicians, all working together as a team, operating and monitoring equipment.

There are possibilities for such an approach in dentistry, too. One of the new areas of dental treatment that we are preparing to study at Mount Zion Hospital and Medical Center is the development of dental teams to carry out comprehensive dental procedures for patients under general anesthesia. The plan is based on the idea that it should be possible to take a patient who requires extensive restorative dentistry and to complete the dental rehabilitation in one lengthy session. This would involve necessary exodontia and operative dentistry, as well as the preparation of abutment teeth and the securing of essential impression records for fixed or removable prostheses.

It is obvious that such an ambitious effort would be beyond the physical capacities of one individual. Yet with a team of dentists each with special skills, and trained dental auxiliary help in addition to the usual operating room personnel, the patient could benefit from this multiplicity of effort.

The chief of the dental department and some interested dentists have conceived a plan whereby a patient will be admitted to the hospital, and, after a thorough medical examination, will be prepared for a general anesthetic. In one of the surgical pavilions a mobile dental cabinet, fully equipped with all the necessary dental armamentarium and supplies, will be set up. Ultra-speed dental equipment will be used for increased efficiency and reduction of fatigue. If two dentists alternated at the operating table, each performing the required operative procedures on a quadrant of the dentition, they could make rapid progress and yet accomplish dentistry of greatest precision.

Such plans are possible at this time since with the present stage of anesthetic pharmacology and physiologic knowledge, it is possible to keep a patient in the necessary plane of anesthesia for a considerable period safely and comfortably. New ultra-speed dental operative devices and rapid-setting restorative materials, as well as easily manipulated and accurate impression substances, contribute as important factors.

This plan that has been briefly alluded to opens up a whole new area of dental therapy for the adult patient.

Wilhelmy[4] said:

> Although most restorative dentistry will always be done in the dental office there are occasions when it is advisable that these procedures be done in the hospital under general anesthesia. The two most common situations in which restorative dentistry in the hospital is

indicated are (1) in the case of persons who prefer such operations to be performed at one time without the inconvenience of frequent dental appointments, and (2) for those persons who have such a high degree of anxiety and apprehension that they neglect to receive routine dental care while in the conscious state.

During the past several years there have been increasing numbers of children with cerebral palsy, or others afflicted with handicaps that have not permitted routine dental office treatment, who have had comprehensive dentistry performed under general anesthesia. In every community there is an increased demand for similar facilities and service. The expansion of dental service to this segment of the population would be not only a most progressive step in hospital and community responsibility, but also a meaningful challenge to the dental profession.

It is around these ideas that hospital personnel, the physician and the dentist should join forces in treating dental disease. The hospital can provide an atmosphere of comfort, safety and convenience, the physician the assurance of total physical well-being, and the dentist the intelligence and skill to consummate the specialized treatment.

Unfortunately, most hospitals are not ready for this new role that they will be expected to assume. The physician still views the oral cavity as an unknown region that he bypasses in peering more deeply into the body recesses. The physician-anesthetist often does not have the training and experience to resolve quickly the special problems of dental anesthesia. Hospitals do not generally have the modern equipment necessary for efficient dental procedures. Operating room personnel have not learned that the demands for efficiency in this specialty are comparable to those in other surgical technics. One is often aware in the surgery of the casual attitude about "just extracting some teeth." What would it be toward "just filling some teeth"? Nevertheless, these are surgical procedures and there is a human life involved.

Even dentists are not ready. Generally, only those who practice oral surgery as a specialty are familiar with operating room procedure. However, the plan proposed for comprehensive dentistry will require extensive programing as well as coordinated training of dentists. In this development, it must be the responsibility of the chief of the dental department to set up criteria and standards for those eligible to carry out dental procedures in this specialized situation. A period of observation, assisting and team participation will in all probability be required by the hospital.

It should be the responsibility of the hospital administration and the chief of the medical staff to integrate the dental department closely into the total medical programing of the hospital. Encouragement should be given to the development of the teaching and research programs that are related to a total program.

The general pathologist is often only casually familiar with the particular tissue changes of oral tissue. The alterations of hard tissues as well as neoplastic changes may be unique. Dentists should be required to provide participants on the tumor boards. Those with special knowledge or interest in oral pathology should be invited to review and consult on the specialized tissues of the mouth and adjacent structures.

Tanchester[5] said:

> Members of the dental profession who practice their calling in accordance with modern scientific principles and who seek to keep abreast of, and contribute to, progress in their fields, know the importance of the basic sciences in their work. Dentists recognize that patients are complex organisms and not simply endowed with teeth that are more or less imperfect, requiring mechanical treatment to restore them to working order. The dental profession recognizes this relationship between dental and medical conditions. The solution of many of these problems can be found in the environment of the hospital. . . .
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> Laboratory and clinical evidence indicate that diabetes, cancer, epilepsy, cerebral palsy, cardiovascular disease and arthritis, can be accompanied by oral health disturbances. The mucous membranes of the mouth manifest the early lesions and symptoms of primary hematologic disorders. Dentistry can play an important role in the rehabilitation of patients who develop these diseases.
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> In the older age group of the adult population, approximately 4 per cent of all neoplasms occur in the oral cavity. With a proper examination such as a qualified dentist can give, an estimation of the nature and extent of the malignancy is possible. In the rehabilitation of these patients, the dental department plays an important role.

It is not unreasonable to require that every outpatient should have a complete dental examination as part of his physical examination and evaluation. One could even approach a point of controversy and include it as part of the evaluation of every inpatient as well. Cadmus[6] stated:

> No one can talk of total health without including in such a concept full dental care, both prophylactic and therapeutic. Therefore, physicians cannot long ignore the realities of dentistry, and if the trustees do not receive their indoctrination from their medical advisers, they certainly should get it from dentists. Therefore, the stronger this force for positive health becomes, the sooner the full realization of dentists' dreams for hospital dentistry will come to pass.

It is realized that this poses a problem of personnel time. However, in our concept of a modern hospital there should be provision for adequate dental personnel. A hospital that is accredited should also develop an interne and resident training program. Such trainees could spend some of their time working with various medical specialties of the hospital and provide a measure of liaison and continuity of effort.

Bluestone[7] has pointed out that hospitals do not make use of the educational opportunities presented by dentists in many instances for two basic reasons. The first is cost; however, since the general hospital is supposed to include all the specialties in its services, dentistry and its preventive possibilities should not be excluded from the hospital's program. The second reason is "the traditional preoccupation of the hospital with specialists who deal with patients of a less ambulatory and more urgent nature which compel priority of service." We are now beginning to recognize, however, that care of acute conditions and care of nonurgent conditions must be integrated in the hospital, and this recognition will hasten the day when dentistry is regarded as no less important than any other health specialty.

Bluestone lists six basic principles for planning the educational relationship between hospital and dentist:

1. The educational program of the hospital should be broadened to include the student of dentistry.

2. Education, in the hospital sense, is more than the factual transmission of

knowledge to a student. It involves also the teaching of nondental colleagues who need the dentist's consulting skill as much as he needs theirs.

3. The value of full-time service in dentistry, as well as in other clinical specialties, should be considered.

4. Teaching is a personal activity, involving every member of the dental staff.

5. Adequate budgeting allowances must be made by the hospital to cover personnel, equipment and supplies.

6. Graduate as well as undergraduate students should be involved in the teaching program.

The postgraduate training courses and other lecture series that are given in a hospital should include lectures by qualified dentists on subjects that are of interest to the physician, such as the growth and development of maxillofacial structures, periodontal disease, oral manifestations of systemic diseases, and preventive measures in dental caries. In many parts of the United States, some physicians still have to be educated to the importance of fluoridation as a vital preventive public health measure.

There might also be joint presentations of the coordinated activities of dentistry with the specialties of otolaryngology and plastic surgery.

Another part of the hospital that is deserving of the special interest of the dental department is the library. Members of the dental staff should evidence enough need for professional literature to require the hospital library to provide a ready reference of important texts. More particularly, the librarian should maintain and bind current dental journals.

There are a considerable number of papers in dental literature that would be of interest and value to physicians in the several specialties. Dentists should also be encouraged to peruse the medical journals. Reading together and thinking together in a library will do much to provide an atmosphere and an accord of purpose that will encourage harmony between the staffs.

We have spoken at length of what the dentist should expect from the hospital and how he may contribute of his professional skills to add to the hospitalized patient's security and well-being. It is equally important to consider what the hospital should expect of the dentist. If it is a community hospital, maintaining clinics, he should give regularly scheduled time to the care and treatment of clinic patients, not only in the realm of his particular interest but also in accordance with the varying needs of patients. He should give generously of his time to any teaching or training program, especially in providing proper motivation and direction to younger men on the staff. He should express a willingness and evidence interest in any hospital activity that enhances its progress and place in the community.

In its turn, the hospital must offer certain intangible things to the professional members of its staff. Some of these have already been discussed. Perhaps the most important is to give the dentist an opportunity to participate in the development of an integrated health program that will deal with the total health needs of the individual and the community. Much

has been said in the past about overspecialization in medicine, and about the tendency of specialists to regard patients as isolated organs—"the heart case in 397," or "the ruptured appendix in 408." Now, the concept is developing of the treatment of the total patient, and of meeting all his psychological, social and physical needs. Today we pay lip service to this concept, but tomorrow it will be a reality.

Once, not so long ago, psychiatry stood on the side lines, as a mysterious field that had little or nothing to do with a patient's physical ailments. Today, we recognize that few illnesses do not contain some emotional component, and psychiatry is rapidly becoming a part of medicine, of surgery, of obstetrics, and of pediatrics.

Dentistry can not stay on the side lines much longer, or it will become completely isolated and left behind in the march of modern medicine. The need for psychiatric research in dental conditions, especially in the younger person, is obvious. Not quite as obvious, but certainly as important, is the need for the dental profession to become more closely identified with medicine. Failure to do so may even entail the risk of having physicians expand the scope of their service in the future to include the specialty of dentistry, especially as the importance of the mouth and teeth to the general well-being of the patient becomes more readily understood and accepted.

To avoid this, and in the interests of their own professional advancement, dentists must join hands with physicians on professional health objectives. There is no better place to do this than in the modern hospital, the central health agency of the community.

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1. Burney, Leroy E. Speech given February 9, 1959, at the Chicago Midwinter Meeting.

2. Henny, Fred A. Dentistry's role in interdepartmental hospital relations. J. Oral Surg. 16:285 July 1958.

3. Cadmus, R. R. Hospital's responsibility for patient care. J. Oral Surg. 16:290 July 1958.

4. Wilhelmy, G. E. Cavity preparation under general anesthesia in a hospital. D. Digest 65:122 March 1959.

5. Tanchester, David. Organization and scope of dentistry in hospitals. J. Oral Surg., Anesth. & Hosp. D. Serv. 17:27 March 1959.

6. Cadmus, R. R. Hospital staff and interprofessional relations. J. Oral Surg., Anesth. & Hosp. D. Serv. 17:37 March 1959.

7. Bluestone, E. M. Hospital's contribution to dental education. Hospitals 31:30 Nov. 1, 1957.

■ American Civilization

Every American takes pride in our tradition of hospitality to men of all races and all creeds. We must be constantly vigilant against the attacks of intolerance and injustice. We must scrupulously guard the civil rights and civil liberties of all citizens, whatever their background. We must remember that any oppression, any injustice, any hatred, is a wedge designed to attack our civilization.—*Franklin Delano Roosevelt.*

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CASE REPORTS

Aneurysm of the right maxilla: *report of case*

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Stedman's Medical Dictionary defines an aneurysm as: "A blood-containing tumor connecting directly with the lumen of an artery or formed by a circumscribed enlargement, either axial or lateral, of an artery." In the case to be reported the aneurysm had an unusual location and presented many problems in treatment and eventual outcome.

The patient was a 13 year old white girl who was admitted to the emergency ward of Highland-Alameda County Hospital, Oakland, Calif., at 12:20 A.M. on January 21, 1955, with a complaint of nosebleed. On admission her blood pressure was 96/54, pulse 116, respirations 18 and temperature 101° F. She was placed on bed rest and supportive therapy, and there was no further incidence of epistaxis during the night. At 10:30 A.M. she was transferred to the pediatric ward for further observation and treatment.

HISTORY OF PRESENT ILLNESS—There had been intermittent periods of epistaxis for the past three years. Two days prior to admittance to the hospital the patient had experienced a nosebleed at 3 A.M., which stopped spontaneously in approximately 20 minutes. The latest episode of epistaxis had been at 12:00 midnight January 20.

She had experienced a toothache with lumps in the right maxilla for the past month. The palate had always felt rough.

EXAMINATION—Physical examination revealed a well-developed, well-nourished, asthenic appearing, hyperactive white girl in no apparent acute distress (Fig. 1, left). Blood pressure was 135/80, pulse 120, respirations 20, and temperature 102.6° F. The mucosa of the right nostril was hyperemic with no apparent bleeding site. There was a hemorrhagic appearing soft tissue swelling in the right maxillary buccal reflex, with associated hypervascularity (Fig. 1, right). The right maxillary bicuspids and molars were mobile and tender to percussion. There was a small fistula approximately 3 mm. above the gingival margin of the first molar. The remainder of the physical examination was essentially negative.

Blood studies revealed the hemoglobin to be diminished to 6.2 Gm. and the red blood cell count to 1,900,000. The hematocrit was 20 per cent. The white blood cell count and differential blood count were grossly within normal limits.

Dental roentgenograms showed evidence of considerable radiolucency in the region of the maxillary right molars and bicuspids with loss of the lamina dura (Fig. 2).

The impression was as follows:

1. Angioma of the right maxilla.
2. Possible aneurysm.
3. Possible blood dyscrasia.
4. Possible malignancy.

TREATMENT AND COURSE—The patient was placed on a soft diet, forced fluids and bed rest. She was given 300,000 units of aqueous procaine penicillin. Blood was drawn for typing and cross matching, and she was given 500 cc.

of whole blood at 1:30 P.M. the day of admission. At approximately 3:45 P.M., this same day, profuse, gushing hemorrhage started from the oral cavity, which filled two emesis basins within five minutes. The site of bleeding was from the small buccal fistula above the right maxillary first molar and could only be stopped by maintaining continuous finger pressure over the fistula.

After immediate consultation with the general surgery staff, it was elected to perform a ligation of the right external carotid artery in an attempt to control the hemorrhage. The patient was taken to surgery at 5:10 P.M., and the procedure was carried out with the patient under thiopental sodium, nitrous oxide and oxygen anesthesia. It was necessary for an assistant to maintain finger pressure intraorally throughout the surgical procedure. At the completion of the ligation the finger pressure was released and profuse hemorrhage began immediately from the original site. The intraoral finger pressure was reapplied and maintained for an additional 30 minutes; when the pressure was released, profuse hemorrhage started immediately. The surgical team then elected to ligate the external carotid artery on the left side in an attempt to control the bleeding. After completion of this procedure, finger pressure was released and the hemorrhage had ceased.

During the surgical procedure the patient's blood pressure had dropped to 80/40, but became stabilized at 100/50 after the procedure. She received 1,500 cc. of whole blood and 500 cc. of 5 per cent dextrose in water during surgery. The patient was returned to the pediatric ward at 11:30 P.M. with a blood pressure of 144/90, pulse 112, and respirations 24. Her vital signs were taken every 15 minutes for eight hours, with the blood pressure becoming stabilized at 118/60, pulse at 112, and respirations 22.

On January 22, the first postoperative day, the vital signs were normal. The patient complained of a sore throat and was rather apprehensive. There had been no additional episodes of hemorrhage since the patient was returned from surgery.

The patient was presented to the tumor board and examined by the staff on January 24. Recommendations were made for the following:

1. Additional roentgenograms of the maxilla and cranium.

2. Roentgenographic studies with a contrast medium (iodopyracet).

3. Consultation regarding the peripheral blood vessels.

Late in the afternoon of that day the patient had a slight hemorrhage from the right nares which stopped spontaneously.

Fig. 1—Preoperative views of patient. Note swelling in right maxillary buccal reflex in view at right

Her postoperative course was uneventful and the patient was discharged on February 9, to be re-evaluated as an outpatient by the oral surgery department. She was examined each week for any progressive change in facial contour. It was noted that the right maxillary buccal reflex was becoming more engorged, with distended veins. On March 21, the patient was re-examined by the tumor board and the following report was given: "It is the unanimous opinion of the tumor board that no additional therapy should be given at this time, since any therapy, whether roentgen-ray or surgery, would be of a relatively mutilating character, and there is the possibility that the lesion will resolve itself." The patient was scheduled to return in two months for further evaluation.

The patient was kept under careful observation during the following two months for further changes in the lesion. She was once again admitted to the hospital on August 23 for additional studies. Her hemoglobin was 13.4 Gm., the leukocyte count was 4,250 and the urine was negative. Roentgenographic examination of the maxilla was made with specially projected films including Waters' view and enlargement focal spot technic. There had been no apparent change in the minimal cystic rarefaction of the posterior right maxillary process. There was no erosion or change in the antral margin. The alveolar process and trabeculated structures did not indicate bone resorption. Because there had been no apparent increase or change in the characteristics of this region since the previous examination, the tumor board recommended continued observation and return for further evaluation in three months.

During the patient's hospital stay, the lesion appeared to subside when she was kept in bed, and there was a definite recession of the facial edema. No hemorrhage occurred. She was discharged August 29, to be followed as an outpatient.

On September 13, a considerable change in facial contour was noted, with sagging of the upper lip and a flushed appearance of the right side of the face with increased skin temperature. The patient was again seen by the tumor board, which recommended evaluation by the Stanford University tumor board. On October 6, she was examined at the Stanford Lane Hospital, San Francisco, and the following was recommended: (1) further observation of the lesion, (2) roentgen-ray therapy to the right maxilla followed by radical resection if the use of radiation did not result in improvement, or (3) radical resection of the right maxilla.

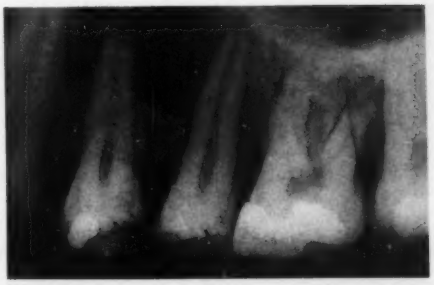

Fig. 2—Preoperative view of right maxilla

On January 9, 1956, the tumor board at Highland Hospital made the following observation: "The extraoral examination reveals moderated soft tissue swelling of the right side of the face, with an obvious erythema extending over the right cheek and downward to involve most of the right side of the upper lip. Intraoral examination reveals strikingly enlarged venous channels in the buccal fold and some increased redness of the gingiva in the region of the lesion. A small cherry red node, 2 mm. in diameter, extends outward from the gingival margin posteriorly." Recommendations were made for angiograms to confirm the presence of a vascular tumor.

After reviewing the angiograms taken at Merritt Hospital, Oakland, Calif., and re-examination by the Highland tumor board on January 30, recommendation of radical resection of the right maxilla was made.

On February 3, at 12:45 P.M., the patient was admitted to the emergency ward of Highland Hospital. Profuse hemorrhage had started from the right buccal fold while the patient was eating her lunch at school. She had applied finger pressure intraorally, which stopped the hemorrhage as long as pressure

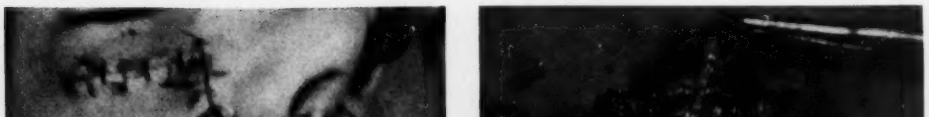

Fig. 3—Left: Immediate postoperative view. Right: Resected right maxilla and floor of maxillary sinus

was maintained. On arriving via ambulance the patient was extremely apprehensive. Fifty mg. of pentobarbital sodium and 50 mg. meperidine hydrochloride were administered intravenously. Her blood was typed and cross matched for ten units of whole blood. She was taken immediately to surgery, and preparations were made for a radical resection of the right maxilla. Her blood pressure was 114/80, pulse 114 and respirations 24.

SURGICAL PROCEDURE—The patient was anesthetized with thiopental sodium and nitrous oxide with oxygen, and a nasotracheal tube with an inflated cuff was used.

Local infiltration of 1:100,000 epinephrine and normal saline solution was injected around the lip and operative site for hemostasis. An incision was made dividing the upper lip in the midline, then to the right side of the nose extending to the infraorbital region, across the infraorbital rim to the lateral canthus of the eye. Hemorrhage was profuse and was controlled by ligation and transfixion. A flap was accomplished by incising high in the buccal vestibule. At this point profuse hemorrhage started from the original site which required finger pressure by one of the assistants. The electric cautery was used to incise around the posterior region of the tuberosity. As the incision was extended anteriorly along the palate, profuse hemorrhage started from this region which could not be controlled by packs or carotid pressure. An osteotome was used to resect rapidly across the infraorbital region and down to the piriform opening of the nose. The palate was sectioned with the osteotome, and the right maxilla was pried down and out. This reduced the area of hemorrhage to the anterior palatine artery. Pressure packs were placed which controlled the hemorrhage in this area. Hemorrhage was finally stopped by the use of saline epinephrine. Electrocautery was used to stop the hemorrhage in smaller areas. The superior two thirds of the right antrum was intact with normal mucosa in place.

After all hemorrhage was under control, the operative defect was debrided of bone spicules. The region was packed with petroleum jelly gauze, and iodoform gauze was used to fill in the defect. The tissue flap was approximated, the subcutaneous and mucosal edges were closed with no. 000 gut sutures and the skin closure was accomplished with no. 000 silk sutures (Fig. 3, left).

During the surgical procedure the patient received four units of whole blood and 500 cc. of 5 per cent dextrose in water. Her blood pressure was 125/60 during surgery, and at no time did it drop below 100/60. She was taken to her room in a satisfactory postoperative condition. During the night her blood pressure remained at 120/70, pulse, 100 to 120. She had some nausea and vomited small amounts of brownish material.

The findings on the first postoperative day were within normal limits. She had considerable edema of the right side of the face.

One half of the cutaneous sutures were removed on the fourth postoperative day, and on the eighth day all remaining cutaneous sutures were removed. The intraoral lesion was irrigated daily, after the eighth day, with warm normal saline solution. The patient was instructed as to home care for the removal and changing of the intraoral dressing. Her general postoperative course was uneventful, and she was discharged from the hospital on February 25.

PATHOLOGICAL REPORT—The specimen was of the entire process of the right maxilla extending anteriorly to include the right lateral incisor. The teeth were all present and firmly oriented in the alveolar process. The specimen included the inferior portion of the body of the maxillary bone and the entire floor of the maxillary sinus. The gingiva was not remarkable except for a small reddish brown area of ulceration just superior to the base of the interdental papilla between the two molars. The third molar was unerupted. The remainder of the lateral surface showed irregularly detached skeletal muscle and connective tissue. From the medial surface, after removal of this plate of bone, a very irregularly shaped, smooth-walled cavity into which the roots of the incisor, cuspid, bicuspid and molars protruded could be noted. The cavity measured 4.5 cm. in length, 1 cm. in maximum width, by approximately 2 cm. superoinferiorly. The cavity extended posteriorly to surround the unerupted third molar. A narrow extension of the cavity extended laterally and posteriorly to the base of the ulcer (bleeding point) which was described on the lateral surface. A piece of the lining of the maxillary sinus was attached loosely to the floor of the maxillary sinus (Fig. 3, right).

After decalcification, the sections showed the large irregular intraosseous space to be lined by a thick layer of connective tissue which was covered by endothelium. It represented the wall of an aneurysm. The aneurysm extended into the bone in some regions and in one portion extended through the bone and into the submucosa. Some regions showed evidence of retrogression of bone, probably pres-

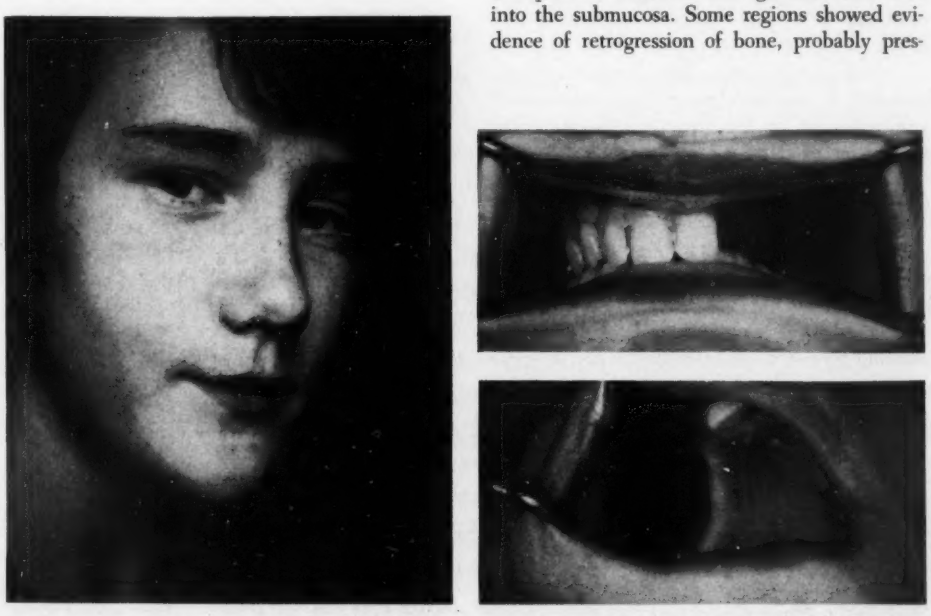

Fig. 4—Postoperative views. Left: Healing of incision lines. Right: Healing of operative site

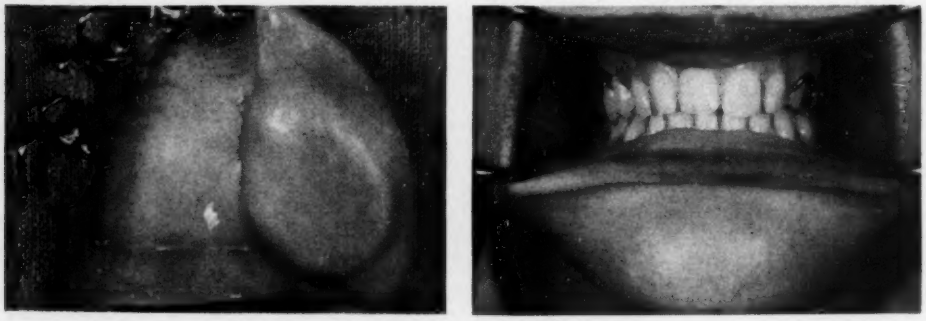

Fig. 5—Left: Denture-obturator constructed for patient. Right: Patient with prosthesis in place

sure atrophy. The blood vessels in the narrow space were very thin walled and extremely dilated. The gingival mucosa was attenuated at some points, and infiltration of the submucosa with lymphocytes and eosinophils was noted. The mucosa from the floor of the right maxillary sinus was infiltrated by lymphocytes and eosinophils.

The diagnosis was aneurysm in the right maxillary bone and chronic maxillary sinusitis.

The postoperative healing period was uneventful. A denture-obturator was constructed and delivered to the patient June 4. After observation by the tumor board on June 18, the following was noted: "This patient shows striking improvement in the motion of the right side of the face with complete healing of all incision lines" (Fig. 4, left). "Examination of the oral cavity shows complete healing of the operative site" (Fig. 4, right). "She now has a prosthesis which occupies the operative defect and gives her good function" (Fig. 5).

DISCUSSION—Because of the severity of this patient's illness, there were many factors which had to be considered in treatment. Numerous consultations and opinions were sought in an attempt to arrive at a successful means of treatment. Radiation therapy was considered as a possible means of reducing the lesion, but because of the patient's age and the probability of inhibiting the growth centers, this mode of treatment was not considered advisable without malignancy's being proved by biopsy. Surgery was delayed because of the mutilating effects of a radical resection of the right maxilla. On completion of the angiograms, it was the unanimous opinion of the tumor board that the lesion was an aneurysm and radical resection was the only course of treatment.

The loss of the lamina dura and area of radiolucency seen in the dental films, but not obvious in the extraoral roentgenograms, the age of the patient and the clinical findings along with the past history were the key factors in the diagnosis.—*1448 South Main Street.*

■ EDUCATION

Never tell a young person that something cannot be done. God may have been waiting for centuries for somebody ignorant enough of the impossible to do that very thing.—*J. A. Holmes.*

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The reorientation of oral surgery into general dental practice

For many years the subject "Oral Surgery for the General Practitioner" has been a very popular one at dental meetings everywhere. Many articles have been published and every phase of oral surgery has been thoroughly explained. One of the most complete papers on this subject was presented by Dingman and Hayward in the November 1947 issue of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION. This article is complete in every detail. It covers anesthesia, flaps, roentgenograms, sutures, frenectomy, alveolectomy, sectioning of teeth, relief of impinging bone, fractured roots, impactions, ecchymosis, loss of roots, openings into the maxillary sinus and foreign bodies.

What can be added?

After many years of practice I believe that we have omitted the most important bit of wisdom which we have spent years in acquiring. That is the plain fact that we who devote all of our time to oral surgery realize better than anyone else that oral surgery and general practice do not mix.

However, it is impossible to tell the general dentist that he should no longer do any oral surgery. This would be ridiculous. There are many areas of the country where there are no oral surgeons and many places too small in population to support a limited practice. The general dentist in a large number of communities must cover every phase of dentistry. He is doing an excellent job. However, I am certain that the biggest headache in his busy practice is in the field of oral surgery.

The extra chair in the busy general dental office is frequently the spot where the incomplete extraction occurs. It usually happens late in the afternoon. The patient has had a grumbling tooth all day and about four in the afternoon decides to leave the shop and drop in to see the family dentist on the way home. No appointment is necessary as he just wants to have the tooth extracted. The patient is tired from the usual

day's work. The dentist is also nearing the end of his day, and the signs of fatigue are beginning to be shown.

The jacket preparation is nearly finished. The patient is a good friend so he is hastily slipped into the operating room with the extra chair. In a few minutes there is a break, exactly long enough to make an injection for the upper first molar. It is just a routine extraction, no roentgenogram is necessary—in fact the x-ray machine is in the room where the jacket is being prepared. Therefore it would be inconvenient and a waste of time.

A few minutes later the operator returns and checks the anesthesia. It appears to be perfect. An attempt is made to remove the tooth. It seems to be a little unusual, more pressure is applied. The assistant becomes a little uneasy—she has a date and expects to be picked up at five. More pressure is applied. Finally there is movement and the crown gives. Attached to the crown are the two buccal roots. The palatal one is missing. Hurriedly an elevator is applied and the root suddenly disappears into the antrum.

About this time the patient reminds his friend the dentist of a serious bleeding problem that lasted for several days after he had had the last tooth removed. It was described on the patient's record but there had not been time to get the record out of the file. The usual excuse that the patient does not want to miss a day of work does not cancel out the risk involved. The complications of the unexpected exit of the root into the antrum and the excessive bleeding could result in hospitalization and several days out of employment. It is the responsibility of the dentist to be aware of these unexpected difficulties that may arise and be firm in his decision on the proper treatment plan.

We pontificate about the fundamental principles essential for any successful surgical procedure and so easily forget that confusion, either mental or physical, can negate a good result.

It is suggested now that one half day or more each week be set aside specifically for oral surgery procedures in the general dental office. Let us assume that Tuesday and Thursday mornings are reserved for all patients to have elective extractions. Adequate time is allowed so that these procedures need not be hurried. With our present antibiotics and prescriptions which control pain well it is seldom necessary to remove a tooth or to do any oral surgical procedure on immediate demand. It must be pointed out, however, that most patients allow several days of discomfort to elapse before making the first approach to the dentist.

On the mornings set aside for oral surgery the entire office and staff (whether one girl or four) take on a very different aspect. The gowns are suitable for an operating room in a hospital. Asepsis becomes the order of the day. The patient is aware of the

autoclave, the sterilizer, the aspirator, the scrubbing technic, the rubber gloves, the anesthesia equipment either local or general, and the sterile suture material. The patient is draped differently (and impressed psychologically). There is no longer the appearance of a general dental office. The first patient may be somewhat surprised to find that his dentist is so alert and up to date in his method of practice that he has separated regular procedures from oral surgery. In all respects the effect is beneficial for both parties concerned.

A few who have tried this suggestion have reported a definite improvement in their ability to extract teeth. Why? I am sure the improvement is due to better concentration among other things. If a person is attempting to hit a golf ball and suddenly someone decides to walk directly in front of him, impairment of concentration may cause him to miss the shot. How much better the emergency, late afternoon extraction would have been if it had been postponed until the following morning that is reserved for oral surgery! Then preparations would be complete and the staff would be geared for surgical procedures, physically and psychologically.

Oral surgery, no matter how minor the procedure may appear, should not be sandwiched in between the regular appointments in the general dental office. Then, too often, surgical precision becomes blurred.

Complete separation of oral surgery in a regular general practice can be easily and successfully accomplished by reserving one half day or more for this field. Thus good physical and psychological preparation of all concerned may be assured and the procedures carried out much more effectively.

Very gratifying results have been reported from such a program by some general dentists.

In the talks oral surgeons frequently make to general practitioners, I feel that they should encourage their listeners to carry their surgical loads freely and admit that part of our success has come from the compartmentalization of surgery from general practice.—*Robert G. Kapp, Sr.*

■ TEXTBOOK OF ORAL SURGERY. Edited by Gustov. O. Kruger. 573 pages with 489 illustrations. $12.75. St. Louis, C. V. Mosby Co., 1959.

Dr. Kruger has prevailed upon some of the outstanding oral surgeons in this country to write about some aspect of oral surgery in which they are particularly interested and certainly competent. The result is the *Textbook of Oral Surgery*, an outstanding text. As stated in the preface, "The lecture sequence in oral surgery was originally suggested by the American Association of Dental Schools in 1935 and modified by a committee on the teaching of oral surgery of the same organization in 1952. A deviation from this outline has been made in this presentation of the material in this book in that the sections on exodontia have not been included. In most schools exodontia is taught as a separate course in the third year and there are several texbooks on this subject." One cannot disagree with the sequence of presentation in this book. Certainly it is logical in terms of both time and knowledge for the beginning oral surgeon.

From the first chapter on "Principles of Surgery" by James Cameron to the last on "Neurological Aspects of Dental Pain" by Athol Frew and Don Ishmael, the book proceeds in an orderly fashion with each chapter taking one aspect of oral surgery and doing a nice job of introducing it to the neophyte. I am sure that neither Dr. Kruger nor his outstanding contributors intended their subjects to be a definitive discourse on the topics of oral surgery which they presented. This, of course, would be impossible, the scope of oral surgery being what it is.

Although intended as a textbook, the general practitioner, the resident and even those with long experience in oral surgery will all find something of importance and interest in this nicely put together book.—*Marvin Revzin.*

■ TREATMENT PLANNING IN THE PRACTICE OF DENTISTRY. By Henry M. Goldman, D.M.D., Lester W. Burket, D.D.S., M.D., and the Staff of the School of Dentistry and Graduate School of Medicine of the University of Pennsylvania. 305 pages. Index. $6.50. St. Louis, C. V. Mosby Co., 1959.

This latest addition to the "Postgraduate Dental Lecture Series" is a small but comprehensive volume emphasizing the fundamentals of treatment planning as the foundation of a successful and efficient dental practice.

The 12 chapters of the text are arranged in a developing sequence beginning with an introductory chapter on the "why" of treatment planning and concluding with two excellent chapters on the integration and coordination of the total treatment plan and case presentation to the patient. The remainder of the book is devoted to various dental procedures such as operative dentistry, endodontics, periodontics, and prosthetics, and includes the basic acceptable technics and ideas in these fields and how they become an integral part of total dental treatment.

For a book of its size it is exceedingly well documented, with good photographs, roentgenograms, line drawings, and reproductions of the elaborate charting system employed at the School of Dentistry of the University of Pennsylvania. Each chapter has a fine list of references which will permit the reader to do additional reading if he so desires.

Although the book is well written, because it is the work of many men it often becomes repetitious.

The greatest value of this book is not in developing a new theme or technic in any phase of dentistry, but simply to integrate many basic concepts of dental practice and permit the busy general practitioner to formulate a total dental treatment plan for his patients.—*Richard C. Baumbach.*

■ HANDBOOK OF BALANCED ANESTHESIA IN DENTISTRY, OBSTETRICS AND SURGERY. By Sylvan M. Shane, D.D.S. 273 pages. Index. $7.85. Baltimore, Lowry & Volz, 1958.

This is a "different kind of book" on anesthesia. It is interesting and informative and well written. The dust jacket admits candidly that the book is not meant to be a textbook.

The reader cannot avoid becoming involved with the controversial personality of the author. His emphasis on the so-called Shane-Ashman technic, and its apparent universal applicability, cannot help but offend the experienced anesthesiologist, whose motto invariably is to suit the anesthesia to the patient and the operative procedure. This is not to imply that Dr. Shane is wrong. As a matter of fact, he is to be complimented for his forthrightness in expounding so positively on a technic in which he obviously has great faith. Dr. Shane's reference to many other agents, particularly new drugs (for example, Fluothane and Methohexital), demonstrates that he is probably more flexible in his practice of anesthesiology than one might assume.

Chapter 4, in which methods of general anesthesia for ambulatory dental patients are discussed, demonstrates that Dr. Shane has a keen grasp of the problems of office anesthesia. He mentions briefly the importance of local or regional analgesia supplementation to general analgesic technics with ultra-short-acting intravenous or inhalation agents. He could have placed greater emphasis on this theory since local anesthetic technics (with or without general analgesia or anesthesia) are the ones of choice for the ambulatory dental patient.

This book is written in a fashion which invites controversy. Dr. Shane's "mathematical" description of the Shane-Ashman technic is an indication that the age of automation is descending upon the field of anesthesiology. There may be more truth to this supposition than most anesthesiologists would care to believe!

Dr. Shane, a dentist, is a hospital anesthesiologist. This reviewer would have been pleased to see the author's dental degree after his name on the cover. Nevertheless, dentistry can be proud of his accomplishments in the general field of anesthesiology. This handbook is a very practical addition to an anesthesia library, and would be of interest to most dentists and physicians who have already had some experience in the field of anesthesiology.—*Bruce L. Douglas.*

■ DON'T WORRY ABOUT YOUR HEART. By Edward Weiss, M.D. 203 pages. Index. $3.95. New York, Random House, Inc., 1959.

In all probability, many "heart" patients will be helped to develop useful insight regarding their problems by this volume. The author is able to impart a personal, intimate feeling in his discussions, and explanations of factors involved are kept at a nontechnical level.

The reader gets the feeling on occasion that possibly too much is being told about actual treatment. The author does not hesitate to emphasize iatrogenic influences, which it must be acknowledged play a part far more often than they should.

Orientation on the general problem is provided in the foreword, in which Dr. Weiss describes development of the psychosomatic concept of disease. Then, after a chapter on cardiac neurosis, the three most common symptoms of such a neurosis are considered in detail. A chapter on treatment contains discussions of prevention and psychotherapy.

There are chapters on high blood pressure and its various emotional causes, with extensive discussion of treatment. In a special section on anxiety and the diseased heart, the author deals with coronary heart disease and emotional and other factors contributing to it. What the family may expect in the way of the patient's reaction to a heart attack is gone over in some detail, and undoubtedly will prove helpful in many situations.

Useful insight into psychologic aspects of heart surgery is provided in a special chapter. In the final chapter, the nature of cerebral vascular disease is explained, with helpful background information about strokes.

Professional workers, as well as the general public, should find this book of practical value. Logical explanations are illustrated by numerous case reports that serve to point up the discussion sharply.—*W. W. Bolton.*

■ KURZLEHRBUCH DER HISTOLOGIE UND MIKROSKOPISCHEN ANATOMIE DES MENSCHEN (SHORT TEXTBOOK OF HUMAN HISTOLOGY AND MICROSCOPIC ANATOMY). By Max Watzka. 274 pages with 264 illustrations, 77 in color. Index. DM. 29.50. Stuttgart, Friedrich-Karl Schattauer, 1957.

This book was written to give to the student a condensed version of the evergrowing factual knowledge of histology by omitting much detail but still not destroying the understanding of tissues and organs as seen in the microscope. It strikes a balance between a manual and the usual textbook.

All in all the author seems to have been successful in this undertaking. The book aims especially at stressing the correlation of structure and function. The results of electron-microscopy are not included, perhaps with some justification, because they lead the dental or medical student too deeply into significant details which are, however, still only half understood.

The illustrations are mainly microphotographs, not all as good and clear as one might wish. Most of the drawings are of good quality. In the crowded schedule of our dental and medical curriculums, such a book seems to fill a long-felt gap.—*Harry Sicher.*

■ THE PHYSIOLOGY OF MAN. By L. L. Langley, Ph.D., and E. Cheraskin, M.D., D.M.S. Second edition. 653 pages with 228 figures and 8 plates and 22 tables. Index. $6.95. New York, McGraw-Hill, 1958.

The 30 chapters in this book are written with clarity and are well illustrated. Basic physiological mechanisms are adequately covered in a highly readable style. Each chapter begins with a brief introduction and ends with a short summary.

The second edition includes considerable new material in physiology, and more anatomy than the earlier edition. All of the illustrations are exceedingly well done and express one major concept.

This book should warrant consideration for elementary physiology courses, such as required for dental hygiene students, or may be useful for a review of basic physiological principles. It is somewhat surprising that so little experimental evidence is presented, since physiology is an argumentative subject.

Considerable attention has been devoted to the nervous system, as has been done by these authors in other publications. This usually difficult section is written simply and logically. It would seem that the autonomics should have been more comprehensively covered.—*Jack G. Bishop.*

■ DOCTOR SQUIBB. By Lawrence G. Blochman. 371 pages. Index. $5. New York, Simon and Schuster, 1958.

Enjoyment of this interesting volume is heightened by the fact that one rarely has such a fine opportunity to observe intimate details of the birth and development of a contemporary industry that now looms so importantly as a servant of the healing arts.

It is difficult to decide which aspect of the chronology is most significant, but running through the entire presentation are the facts of Dr. Squibb's honesty and high moral character. It is indeed reassuring to know that today we are able to rely on our pharmaceutical houses to provide us with pure and effective drugs. The story of how Dr. Squibb worked so valiantly, and often against great and sinister odds, to bring about this situation makes an interesting chapter in the history of health progress in this country. There can be no doubt that through his efforts the U.S. Pharmacopoeia was ultimately delivered "into the control of the physicians" and ethics in pharmacy were firmly established. Also noteworthy is the

pioneer work of Dr. Squibb in developing means of keeping those using drugs promptly and completely informed regarding new products or changes in old products. Evidence, in his own meticulous notes and in the *Ephemeris*, conceived and published by him, shows it was through his influence that groups such as the American Dental Association and the American Medical Association finally established their special Councils for such evaluations.

Dr. Squibb's contribution to improvement of Navy practices regarding drugs and medical services alone is sufficient to establish his life as one that was truly rewarding to both his country and himself.

So warmly intimate are the detailed accounts of Dr. Squibb's family life, his trials, and his triumphs that at the end, when Dr. Squibb dies at the age of 81, one feels a great personal loss.—*W. W. Bolton.*

■ Disorders of the Temporomandibular Joint. By Laszlo Schwartz, D.D.S., and 18 contributors. 471 pages. 458 illustrations. Philadelphia, W. B. Saunders Co., 1959.

The *Disorders of the Temporomandibular Joint,* by Laszlo Schwartz, is a very readable book based on the author's intensive study and experience at the temporomandibular joint clinic at the Columbia-Presbyterian Medical Center. In addition, contributions made by other distinguished authors give a well rounded picture of disorders and treatment of this most interesting and complex joint.

The book is divided into sections ranging from such topics as historical background, pain-dysfunction syndrome, functional anatomy, and embryology in Section 1, to diagnostic procedures, differential diagnosis, methods of treatment, and management of disorders in other sections.

In discussing diagnostic procedures, the importance of an adequate history and physical examination is stressed. Roentgenographic technics are described as well as roentgenographic interpretation. The features of such entities as dental pain, trigeminal neuralgia, salivary gland pain and emotional factors in facial pain are considered in the differential diagnosis.

The rationale of occlusal equilibration and other methods of treatment of disorders of the temporomandibular joint is presented as well as the management of such disorders as clicking, dislocation, subluxation, and condylar fractures.

Throughout the book the author uses many well selected case reports to illustrate various aspects of temporomandibular joint disorders. Roentgenographic reproduction is of good quality as are the photographs.

The author has given the profession a rather complete text which adequately covers many of the complexities of the temporomandibular joint. It is recommended for all who are interested in this topic, whether they are specialists or general practitioners.—*Paul H. Mathews.*

■ Occlusal Equilibration and Temporomandibular Joint Dysfunction. By Nathan Allen Shore, D.D.S. 323 pages with 242 illustrations. Index. Philadelphia, J. B. Lippincott Co., 1959.

This new text should be read and studied by all dentists. It is the first book to be devoted specifically and entirely to the subject of occlusal equilibration in relation to temporomandibular joint dysfunction. However, the discussion of occlusion well may be applied to other fields of dentistry.

Great stress is placed on the study of the components of the stomatognathic system including the teeth, periodontium, bone, neuromuscular system, and the temporomandibular joint. It is shown that by proper management of the teeth the entire stomatognathic system can be controlled.

Since about 20 per cent of all people have some degree of temporomandibular joint dysfunction and since many of these people may have most unpleasant complications, correct diagnosis and treatment are of great importance. It is the author's contention that about 90 per cent of temporomandibular joint dysfunction is a manifestation of pathologic occlusion.

Much of the book is concerned with the study of pathologic occlusion and the equilibration of the dentition in centric and eccentric ranges.

All procedures in examination, diagnosis and treatment are thoroughly explained in great, but unburdening, detail. The illustrations are generous in number and are well chosen. The last chapter is especially interesting since it presents representative case histories which illustrate the various types of pathologic mandibular relationships.

The reader is greatly stimulated by the straightforward style in which the subjects are presented. Occlusal equilibration is presented not as a subdivision of a specialty of dentistry but as a principle which is basic to all branches of dentistry.—*Zar A. Reader.*

■ TREATMENT OF CANCER AND ALLIED DISEASES. Volume III—Tumors of the Head and Neck. Second edition. Edited by George T. Pack, M.D., and Irving M. Ariel, M.D. 769 pages with 1,028 illustrations. Bibliography. Index. $30. New York, Paul B. Hoeber, Inc., 1959.

The aid of 70 competent authors has been enlisted to produce an unusually thorough and detailed treatise which will provide a broader background and more complete understanding of the presently advocated methods of treatment of tumors of the head and neck.

Under the heading of general principles, the routes of spread of cancer of the head and neck are discussed in a concise and interesting manner. Subsequent chapters in this group review fundamental knowledge of general and local anesthetic technics and include an adequate discussion of certain postoperative complications.

Equal emphasis is placed on surgical and radiological treatment. Criteria governing the choice of treatment are presented and numerous references are quoted. Cure rates are summarized to aid the reader in evaluating the effectiveness of various methods of therapeutic treatment.

Numerous technical details are discussed thoroughly and illustrated vividly, including conservative and radical surgical procedures, reconstruction, radium needle and radon seed implant, design of radiation portals and dosage calculation.

■ ORAL HISTOPATHOLOGY. By Martin Rushton, M.D., and Brian E. D. Cooke, M.R.C.S., 190 pages. Index and illustrations. $7. Baltimore, Williams & Wilkins Co., 1959.

This book contains a compact and clear presentation of principal histopathologic disorders of the oral cavity. Over 200 photographs are conveniently arranged and integrated with the text. The contents are grouped into four main divisions, (1) the teeth and their formative elements, (2) the periodontal tissues, (3) the oral mucosa, and (4) the mandible and the maxilla. Each of these main divisions is further subdivided. This method of classification is an aid to readers interested in lesions characteristically occurring in a particular region. Easy access to the information available in this book on a discrete pathologic condition is assured by the index and cross references. Bibliographies follow each subdivision and, as the authors point out, are not complete and are meant to serve as "starting points for further inquiry."

It is not the purpose of this book to present all of the various hypotheses or to discuss in detail factors related to the genesis of the lesions. As a result, the terse treatment of certain controversial points may evoke criticism by some readers. The curtailment of a disputed issue to one aspect will be recognized by those experienced in oral pathology and will be understood to be inherent in a book of this brevity. Supplemental information should be supplied to the beginning student, however, on debatable issues.

The material in this book is well integrated and the illustrations are aptly chosen. A practitioner or student should enjoy this book and find its uncluttered presentation of basic information on oral histopathology very useful.—*William K. Elwood.*

■ EXPERIENCES IN THE SURGICAL MANAGEMENT OF TIC DOULOUREUX. E. S. Gurdjian, J. E. Webster and D. W. Lindner. Surgery 45:264 Feb. 1959.

This paper deals with 25 years experience in the surgical management of tic douloureux based on 248 patients on whom 391 operations were performed. The ages of the patients ranged from 26 to 90 years; 80 per cent of them were over 50. The ratio of men to women was 6 to 7. Eighty-three per cent had symptoms for more than one year and 40 per cent had symptoms for more than five years. Definite trigger mechanisms were recorded in two thirds of the patients. Bilateral tic was present in 15.

Patients experiencing the first attack of the disease are usually treated conservatively. With repeated bouts of pain, decompression may be used with good results expected in 75 to 80 per cent of the patients. Seventeen per cent of the patients undergoing decompression had recurrence of pain necessitating section of the sensory root. If sectioning of the trigeminal root is decided on, it is preferable to do a subtotal section to preserve the corneal and conjunctival sensations. Medullary tractotomy for major trigeminal neuralgia has not been used in this series very many times. We have been afraid to use tractotomy because the results are not constant for third division pain.

Numbness involving one or two divisions of the trigeminal nerve may be present after a decompression operation. As a rule there is no anesthesia after the decompression operation. A facial paralysis may occur with this procedure and in some instances may not be seen immediately after the operation. Presumably this may be due to trauma to the greater superficial petrosal nerve. The problem of corneal ulcers is an important one, but in patients who have had the decompression or partial sectioning of the sensory root this condition becomes less likely. In general, although conservative treatment may be used in early cases, ultimately surgical treatment becomes necessary. Decompression of the sensory root has been a satisfactory first step in management of 83 per cent of the patients. Those having a recurrence of pain may then be treated by a subtotal sectioning of the sensory root.—*Irwin A. Small.*

■ ADAMANTINOMA OF THE JAWS: A CLINICOPATHOLOGIC STUDY OF 101 HISTOLOGICALLY PROVED CASES. James K. Masson, J. R. McDonald and F. A. Figi. Plast. & Reconstr. Surg. 23:510 May 1959.

The term "adamantinoma" is one of the earliest and most commonly used names applied to an epithelial tumor arising from the paradental epithelial debris or from cells with a potentiality for forming tissues of the enamel organ. It has been described as usually unicentric, nonfunctional, intermittent in growth, anatomically benign and clinically persistent. It occurs in various locations about the body, but by far the greatest number are encountered in the upper and lower jaws, and about 80 per cent of those in the jaws are located in the mandible.

One hundred and one cases of clinically and microscopically proved adamantinomas from the clinical files of the Mayo Clinic were used for this study.

Structurally, 66 of this group were mainly cystic and 19 were primarily solid tumors; in 16 cases, the structure was not mentioned. Of the 80 tumors in the mandible whose location could be established, 20 per cent were anterior, 64 per cent in the molar region, and 13 per cent involved the entire side from symphysis to condyle. In the maxilla the molar region again was the prominent site of origin.

Microscopically the tumor consists of loosely arranged stellate cells centrally located in the epithelial bud and surrounded by columnar peripheral cells arranged in palisade formation.

The stellate cells correspond to the stellate reticulum and the columnar cells to the ameloblasts of the enamel organ.

The typical picture of stellate cells and peripheral columnar cells was found to be subject to wide variation. Four distinct patterns of epithelial cells were apparent. These were designated as (1) plexiform, (2) squamous, (3) glandular and (4) sarcomalike.

The plexiform type—67 of the 101 tumors were of this type—is characterized by the appearance of numerous cell masses, buds, follicles, trabeculae and strands that are scattered and interwoven diffusely throughout a rather fine connective tissue-supporting structure. In the majority of these tumors, various stages of cyst formation occur in the stellate reticulum, initiated by a process of cystic degeneration of the relatively avascular stellate cells.

Twenty-four tumors were of the squamous type. In these tumors the predominant cell is the squamous cell which may be in the form of strands, clumps or sheets that sometimes make up an entire section. As the squamous change progresses to involve the peripheral cells, it is difficult or impossible to make a differential diagnosis unless zones revealing the typical enamel-organ structure are found.

Eight of the tumors were of the glandular type. These lesions are so named because they contain an abundance of a mature secretory type of tall columnar cell with basally situated nuclei, a large amount of clear pink cytoplasm and a distinct cell membrane.

Only two sarcoma-like types were encountered in this series. The epithelial cells were arranged in diffuse masses of closely packed elongated and darkly staining cells, with no resemblance to the adamantine structures noted in large areas of the sections. The stroma had an appearance similar to that of fibrosarcoma.

All types were capable of recurrence. The number of patients with recurrent adamantinoma at the time of admission in this series (72 per cent) is considerably greater than in any other group of cases reported.

The adamantinoma is a slowly growing, epithelial tumor most frequently involving the jaws, particularly the lower jaw. It occurs most often in middle life and in women slightly more frequently than in men. It recurs after incomplete removal in almost 100 per cent of cases, and it is capable of invading soft tissue and bone. Whether it is malignant is a debatable question. Only one tumor in this series definitely proved its malignant characteristics by distant metastasis to a cervical lymph node. As a general rule, the lesion is benign, with a characteristic tendency to recur.—*Donald B. Rae.*

■ A Comparison of Duration of Hypnotic Doses of Thiopental and Methitural of Electroshock Therapy. David Little, Jr., Christian Cretur, and Ralph Tovell. Anesthesiology 20:177 March-April 1959.

A comparison of the duration of single hypnotic doses of thiopental sodium and methitural sodium has been made in 53 patients undergoing frequent electroshock therapy, each patient receiving each drug on two or more occasions and serving as his or her own control. Induction time for methitural sodium was approximately twice that for thiopental sodium. The total anesthesia times produced by comparable doses of each drug were virtually identical. The duration of hypnosis after administration of methitural sodium was shorter than the duration of hypnosis after a comparable dose of thiopental sodium, but the difference was not statistically significant.—*Irwin A. Small.*

■ End Results in the Combined (commando) Operation for Mouth Cancer. H. Mason Morfit, M.D. Surg., Gynec. & Obst. 108:129 Feb. 1959.

The "commando" operation for mouth cancer involves neck dissection combined with intraoral extension (usually jaw resection) designed to remove the primary tumor and regional lymphatics at one stage. It is adaptable to the removal of primary tumors occurring at several

different sites in the oral cavity. Any such series will therefore include a variety of tumors originating in these different locations. This series includes primary tumors which originated in the tongue, gum, tonsillar pillar, floor of mouth as well as some lip cancers in which the primary lesion was previously controlled but metastasis to the submaxillary region invaded adjacent bone. All were squamous or epidermoid carcinomas. Many invaded adjacent periosteum or true bony cortex. This series consisted of patients in whom treatment by either radiation or more limited surgical removal has been shown repeatedly to be of little value.

During the years 1948 to 1955, a total of 58 operations were carried out. The entire group has been evaluated for the results obtained at the end of three years following definitive treatment. Although it is admitted that recurrent disease may rarely develop after a three year period, this interval is a fair test of effectiveness for this particular variant of cancer. In the group of 30 treatment failures, four patients died as a direct result of the operation. Of the remaining 26 treatment failures, in 19 patients (73 per cent) recurrent cancer developed within one year after surgery, in five patients (19 per cent) the cancer recurred in the second year after surgery, and in only two patients (8 per cent) recurrence took place during the third postoperative year. In no patient who remained well for three years after treatment has recurrence yet to develop in this series. The over-all salvage rate in this group of patients was 46.6 per cent. Routine tracheostomy is now an integral part of the operation. Failure to do this accounted for two of the early postoperative deaths attributed to postoperative respiratory obstruction. Fistulas developed in 24 per cent and healed via secondary intention in every case; no incidence required secondary closure.

The more posterior the oral defect the greater was the difficulty in swallowing, but all patients recovered the ability to eat via normal channels.

Restoration has not been successful in the large mandibular defects. Dental prostheses, pins, and bone grafts were used in a small group of patients, but the results were so unsatisfactory that they were soon abandoned. If the defect is small (1 to 2 inches in length) and if a reasonably long proximal segment is left, the defect may be bridged at a later date with a graft. Unless the symphysis menti is sacrificed, a good cosmetic result can be achieved in these cases. If the symphysis is sacrificed, as it sometimes must be for lesions of the anterior floor of the mouth, subsequent reconstruction is difficult and usually unsatisfactory. This is at least partly owing to the fact that in order to circumvent the tumor adequately, a considerable amount of soft tissue as well as bone must be sacrificed. Most of the patients have adjusted well to partial loss of the mandible. Nutrition has not been a problem and most patients have been most willing to accept this price for getting rid of the tumor.—*Myron Kaufman.*

■ Excision of Obstructing Retropharyngeal Tumor in an Infant. Samuel L. Perzik, M.D.; Henry J. Rubin, M.D., and Richard Schorr, M.D. A.M.A. Arch. Surg. 78:155 March 1959.

The choice of a surgical approach to the pharynx depends upon the location and size of the lesion under consideration. If primarily located in the oropharynx, a direct transoral approach is usually adequate. The nasopharynx may also be reached through an intraoral approach with or without a soft-palate-splitting incision or removal of part of the posterior bony palate. If this is not adequate, a lateral pharyngotomy with or without a transection at about the angle of the mandible may yield a good exposure of the nasopharynx.

In certain instances a transantral approach through a Caldwell-Luc or Weber-Fergusson incision may be elected. The hypopharynx may be reached by suspension laryngoscopy or through an anterior or lateral pharyngotomy exposure. Very extensive lesions in these regions, especially those that require complete extirpation with a maximum of safety, challenge the effectiveness of any of these surgical approaches. A situation of this type in an adult

was managed by Klopp through a sagittal transection of the lower jaw. In the procedure he split the lower lip, chin, mandible, submental triangle, and tongue back to the vallecula. When faced with a similar retropharyngeal tumor problem in a three month old infant, this approach was utilized with complete satisfaction.—*Martin F. Anderson.*

■ A METHOD OF RECONSTRUCTING THE LOWER LIP FOLLOWING EXCISION FOR CARCINOMA. William F. MacFee, M.D. Ann. Surg. 149:903 June 1959.

The operation is a one-stage procedure concerned with the reconstruction of the lower lip after complete or nearly complete excision for cancer. It consists essentially in construction of a new lip from the cheek adjacent to the mouth and the incorporation of the lip in a large double-pedicled facial flap, disposed longitudinally, by means of which the lip is brought into the desired position.

1. After the lip has been excised, an incision is started at the angle of the mouth and carried laterally and slightly upward in a direction parallel to the lower margin of the mandible. The length of the incision should equal the transverse width of the lip defect. The incision goes through all structures of the cheek. The marginal mucous membrane is then sutured to the margin of skin to provide a vermilion border for the new lip.

2. The apex of a triangle is established at a point on the skin about 2.5 cm. below the inner canthus of the eye in the nasomaxillary angle. From this point one leg of the triangle is projected to the lateral end of the incision previously made in the cheek and the other leg is carried to the medial end of the incision. This triangle, consisting of skin and subcutaneous fat only, will subsequently be excised when the new lip is brought into correct position.

3. An incision is now started at a point about 2 cm. below and 2.5 cm. lateral to the external canthus of the eye and carried posteriorly and downward in front of the ear and close to it around the lobe to the sternocleidomastoid muscle and then downward and forward over the muscle and parallel to it for a distance of approximately one half its length.

4. Elevation of the cheek flap is begun at its posterior border and is carried forward to a limit slightly beyond the anterior border of masseter muscle. The plane of dissection lies between the subcutaneous fat and fascia covering of the parotid gland and masseter muscle. Care must be exercised to avoid injury to the external maxillary artery.

5. The raising of the flap is continued and completed from the anterior approach. The dissection is begun at the anterior margin of the flap and continued posteriorly at the level maintained during elevation of the posterior part of the flap. As the dissection proceeds, the lower margin of the mucous membrane of the new lip is cut through from the mouth and the lip is elevated with the flap as part of it. The dissection is continued until the anterior and posterior fields are joined and the large facial flap remains attached only by its upper and lower pedicles and the facial artery.

6. The mobile flap is now displaced forward until the newly constructed lip rests easily in its position. Before the lip is sutured, however, it is advisable to close the defect in the buccal mucosa and the region from which the new lip was taken. As a rule the posterior wound can be completely closed without excessive tension.

Postoperative care is relatively simple. Feeding during the first week should be by nasogastric tube to avoid intraoral pressure on the suture lines. The mouth should be irrigated as often as necessary to maintain cleanliness.—*Irwin A. Small.*

■ PRIMARY CANCER OF THE BONE. N. L. Higinbotham, M.D. New York State J. Med. 15:2023 May 1959.

Most primary malignant bone tumors will fall within one of the four principal types.

1. Osteogenic sarcoma
2. Ewing's endothelioma
3. Primary reticulum cell sarcoma
4. Multiple or plasma cell, myeloma

Although the prognosis for any primary malignant bone tumor is not favorable, with early diagnosis and adequate treatment, five year survival rates may run as high as 48 per cent in reticulum cell sarcoma. Contrary to common opinion, amputation is capable of providing approximately 21 per cent survivals in five years in osteogenic sarcoma. These percentages deteriorate to the point of only 4 per cent five year survival rate in Ewing's endothelioma. No figures were offered for multiple myeloma.—*Martin F. Anderson.*

■ MEDIAL CLEFTS OF THE LIPS. Herbert A. Ecker, M.D., D.D.S. Am. J. Surg. 96:815 Dec. 1958.

Two patients, one with a median cleft of the lower lip and one with a median cleft of the upper lip, both associated with broad frenums, were studied. Median clefts of the upper and lower lips in these two cases seemed to be related to a persistence of an ectodermal-mesodermal structure connecting the ectodermal hood of the lips to the ectoderm of the inner oral structures. If one is to accept the failure of mesodermal ingrowth into the ectoderm as the cause for clefts of the upper lip and hard palate, it could be postulated that in these cases the ingrowing mesoderm becomes displaced to the frenum regions. This could result in a persistence of the frenums in median clefts of the lips.—*Myron Kaufman.*

■ MALIGNANT DISEASES OF THE HEAD AND NECK IN CHILDREN. H. W. Southwick, M.D.; D. P. Sloughter, M.D., and J. P. Majarakis, M.D. A.M.A. Arch. Surg. 79:678 May 1959.

At the present time, exclusive of accidents, malignant neoplastic diseases result in more deaths in the 4 to 15 year age group than any other single cause. Seventy cases of malignant diseases of the head and neck area over a 15 year period were reviewed. This material was drawn largely from the University of Illinois Research and Educational Hospital. These patients had 48 sarcomas and 22 carcinomas. Forty-three patients had a soft tissue mass in the neck without intraoral pathology. There was an almost even distribution of sex.

The most striking feature of the malignant disease progress, in children in contrast with adults, is the preponderance of sarcoma over tumors of epithelial origin. The most frequent sarcomas were the lymphoma, the lymphosarcoma, Hodgkin's disease and the fibrosarcoma. The carcinomas most frequently found were located in the thyroid, the salivary gland, antrum, and gingiva.

It might be said that with the majority of tumors the salvage rate could be expressed as a function not so much of the cell type as of the alertness of those who undertake the treatment of infants and children.—*Martin F. Anderson.*

■ TUMORS OF THE MANDIBLE IN CHILDREN. Robert J. Richardson, D.D.S., M.D., David W. Robinson, M.D., Frank W. Masters, M.D. Plast. & Reconstr. Surg. 23:576 June 1959.

Tumors of the jaw are relatively rare in children. Although subject to all varieties of adult epithelial and osteogenic neoplasms, the benign tumors predominate. Yet the existence of malignant lesions requires clinical alertness. Recognition of specific tumor types depends on microscopic proof and not roentgenographic or clinical impressions. The basis for this discussion is experience with seven children who, as representative types, have been seen in a medical center within the past ten years.

If Conheim's theory of cellular differentiation holds true, the mandible may be the site of tumors composed of any or all ectodermal or mesodermal cell types or a combination of both.

Fibrous tumors of the mandible are common in children and occur at an average age of 15 years. The final diagnosis depends on biopsy, and the pathologic picture of these lesions reveals fibrous tissue undergoing varying degrees of ossification. Treatment consists of conservative surgical removal if the growth progresses.

Giant cell tumor may take the form of a centrally placed bone cyst or of an exophytic

giant cell fibrous epulis. The central type is relatively rare in children.

Ameloblastoma rarely occurs in children but has been reported in infants as young as five months. Treatment consists of total removal with curettage of all locules. The possibility of recurrence makes frequent follow-up examinations mandatory.

Eosinophilic granuloma has been reported in the mandible of a 19 month old child. No treatment is indicated in the light of present knowledge.

Isolated cases of hemangioma, lymphangioma, neurofibroma, and schwannoma have been reported. Treatment of these exceedingly rare tumors is by local surgical excision.

Malignant tumors occur infrequently in the mandibles of children. Malignant ameloblastoma has been reported. Carcinoma of the gingiva and adjacent epithelial structures which secondarily invades the mandible is practically nonexistent in children.

Sarcoma of the fibrous osteo, angio, lympho, or neural types rarely occurs. The only treatment for the proved malignancy, other than palliation, is radical surgical removal with a margin of normal tissue.

Seven case examples are cited from the experience in the medical center.—*Donald B. Rae.*

■ STATUS OF TREATMENT OF THE ACUTE RADIATION SYNDROME. M. P. Docquisto and J. B. Hartgering. M. Ann. District of Columbia 4:200 April 1959.

The term "rad" has been adopted and represents the absorption of 100 ergs of energy per gram of irradiated material. Exposure to one roentgen ray leads to the absorption of about 87 ergs per gram. Although the primary forms of radiation differ in their penetration and other physical characteristics, the term "rad" is useful.

Granted that there are biologic variations, the effects on exposed individuals with 200 rads can be plotted roughly. They have nausea vomiting as well as a drop in the circulating leukocytes. Nearly all persons with above 300 rads will require hospitalization. One thousand rads is considered a 100 per cent lethal dose.

In the middle range of 300 to 800 rads, medical treatment can alter the clinical course. The primary pancytopenia with the usual complication of infection and hemorrhage can be combated with antibiotic therapy and transfusions of platelets. In large scale disaster no such measure is available.

Experimentally in animals two drugs show promise in protection against a 100 per cent lethal dose. Both of these drugs are too toxic in large amounts. Their mechanism of action is not understood.—*Martin F. Anderson.*

■ LETHAL MIDLINE GRANULOMA OF THE FACE. Nolan Resnick, M.D., and Philip V. Skerrett, M.D. A.M.A. Arch. Intern. Med. 103:116 Jan. 1959.

Lethal midline granuloma was first described by McBride in 1897 and is rare. It rarely occurs below the age of 20 and is almost nonexistent in females.

The etiology of this condition is unknown. Most frequently the diagnosis can be made only by exclusion. There is a highly characteristic clinical course in most patients characterized by progressive destruction of the tissues of the face with ulceration and necrosis, leading to death within a period of a few months. The cause of death is usually terminal meningitis, brain abscess, septicemia or pulmonary infection.

Since laboratory diagnosis is unsatisfactory, even including biopsy, which is nonspecific histologically, the treatment has been symptomatic. Radium and roentgen therapy in small doses as well as the antibiotics and corticotropin (ACTH) and cortisone have been used. The results of this therapy have been largely unsatisfactory. A case of lethal midline granuloma is reported.—*Martin F. Anderson.*

Announcements

■ Conference on Clinical Trials of Dental Drugs Scheduled

A conference on clinical trials of dental drugs, sponsored jointly by the Council on Dental Therapeutics and other agencies of the American Dental Association and by the American Association of Dental Schools, will be held Wednesday, March 16, 1960 in Chicago. The primary purpose of the conference is to provide the Council on Dental Therapeutics with the best available basis for the evaluation of drugs considered in its acceptance program.

Further information may be obtained by writing to the Secretary of the Council on Dental Therapeutics, American Dental Association, 222 East Superior Street, Chicago 11.

■ Army Medical Museum Seeks Material for Centennial Exhibits

The Armed Forces Institute of Pathology, which will celebrate its one hundredth anniversary during and concurrently with the Civil War Centennial, is seeking military medical material to expand the many famous collections of historical items in its Medical Museum.

The museum houses one of the finest collections of microscopes in the world, but few have been added in recent years. Efforts are now being made to fill the gaps, particularly for the years from 1920 to the present.

It is requested that persons having items they might wish to contribute write to the director, Armed Forces Institute of Pathology, Washington 25, D. C., relative to the acceptability of items and shipping instructions.

■ New Dental Clinic Dedicated at Philadelphia General Hospital

Said to be the most modern and complete dental clinic in the country, this new department of the Philadelphia General Hospital was dedicated on October 14. It has 21 dental chairs, 10 dental units, a dental research laboratory, closed circuit television, intercommunication system and complete air-conditioning.

Robert H. Ivy, first dental intern at the Philadelphia General Hospital and the first dental intern in America, was presented a plaque commemorating his internship in 1901.

■ Applications Being Accepted for Graduate Study at Pittsburgh U.

Applications are now being accepted by the graduate division of the University of Pittsburgh School of Dentistry for graduate study in the fields of anesthesiology, oral surgery, orthodontics and prosthodontics, leading to the degree of Master of Science. Selection of students for the fall session of 1960 will be made in April 1960.

A non-degree, full-time 12 month course in general anesthesia is also available for qualified dental graduates. Further information and application forms can be obtained by writing to: Director of Graduate Education, University of Pittsburgh, School of Dentistry, Pittsburgh 13.

■ Cleft Palate Rehabilitation Group Plans Convention

The American Association for Cleft Palate Rehabilitation will hold its 18th annual convention at the Brown Palace Hotel in Denver May 12-14. The association's secretary is D. C. Spriestersbach, University Hospitals, Iowa City.

■ Academy of Oral Pathology to Meet at Northwestern University

The 1960 meeting of the American Academy of Oral Pathology will be held April 28 and 29 at Northwestern University in Chicago. Further information can be obtained from R. J. Gorlin, School of Dentistry, University of Minnesota, Minneapolis.

■ Memphis Hospital Announces Internship and Residency Available

The Veterans Administration Medical Teaching Group Hospital of Memphis, Tenn., announces that one rotating dental internship and one residency in prosthodontics will be available for the year beginning July 1, 1960.

Information and application forms can be obtained from: Chief, Dental Service, Veterans Administration Medical Teaching Group Hospital, Memphis 15.

■ Advanced Oral Pathology Offered at University of Minnesota

The University of Minnesota School of Dentistry has announced its third annual course in advanced oral pathology will be held April 21-26, 1960. The course, which is limited to 20 participants, consumes approximately half of its time in the examination of about 200 slides.

Lecturers will be prominent pathologists and oral surgeons from different universities and hospitals. Tuition is $100. Further information can be obtained from: Dr. Robert J. Gorlin, professor and chairman, Division of Oral Pathology, School of Dentistry, University of Minnesota, Minneapolis 14.

■ Oral Pathology Fellowship Offered at University of Pennsylvania

Applications are being accepted for a clinical fellowship in oral pathology supported by the American Cancer Society, tenable at the department of pathology, School of Dentistry, University of Pennsylvania, for a period of one year beginning July 1. A stipend of $3,600 (tax free) accompanies the fellowship.

Candidates are requested to submit a curriculum vitae and letters of reference to: Dr. C. E. Wilde, Jr., Department of Pathology, School of Dentistry, University of Pennsylvania, 4001 Spruce St., Philadelphia 4.

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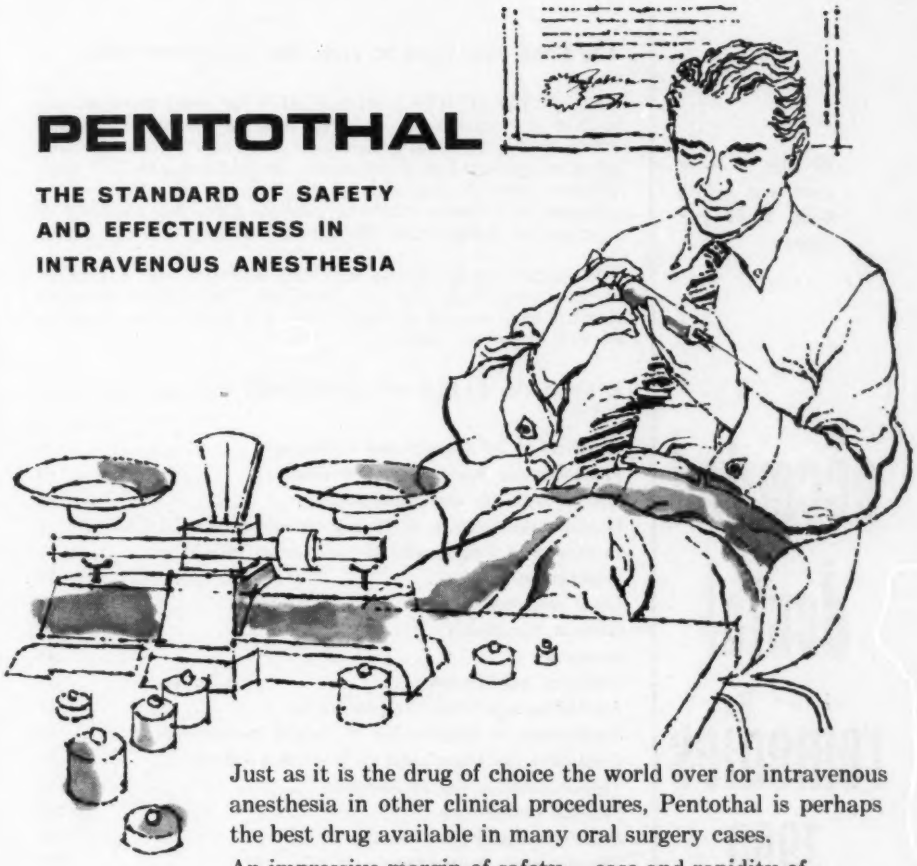

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